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Global Diversification and Firm Performance: A Dynamic Perspective.

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GLOBAL DIVERSIFICATION AND FIRM PERFORMANCE: A DYNAMIC PERSPECTIVE

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To my parents,

Alice, Tyrone, and Sylvia

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

In concert with increasing attention to global competition, global diversification has emerged as a significant area of study in strategic management. This study examined a sample of U.S. manufacturing firms to investigate several important issues in the relationship between global diversification and firm performance. The results showed that changes in global diversification have a significant influence on changes in all accounting measures of performance used in this study. However, when the data were analyzed cross-sectionally, global diversification had only a limited influence on profitability and its stability. This indicates that attempts to postulate any dynamic relationship with inference from cross-sectional results should be done with caution. The dynamic analysis also showed that global diversification components are interactive rather than independent in their influence on firm performance. The interactions between global diversification components provide insights for some high performing dynamic global diversification strategies.

Ohmae's (1985) assertion that technology-oriented firms tend to enter the triad region (Western Europe,

North America and Japan) for technological advantage and market enlargement was only partially supported. However, firms which are primarily operating in low-tech industries can improve their performance through increasing global diversification in non-triad countries.

A geographic measure of global diversification was developed for this study. The results showed that diversification measures with a geographic orientation are better than those with a product orientation in explaining the impact of global diversification on firm performance from the dynamic perspective.

Implications for future research and management practice are also discussed.

CHAPTER 1 INTRODUCTION

An increasing number of firms are pursuing global opportunities rather than competing solely in domestic markets (Kotabe, 1989; Porter, 1986). The entry of British and Japanese firms into U.S. markets and the movement of many American firms abroad signify the trend of global competition (Business Week, May 14, 1990). Strategic management researchers have already realized that often, and increasingly, competitive advantage can be won only from a global view of competition (Porter, 1986; Schendel, 1991). Global diversification, which combines product diversification and globalization, has correspondingly emerged as a significant area of study in strategic management.

In the past, the words global, multinational, and international have been used in similar contexts to convey similar concepts. Bartlett and Ghoshal (1989) helped draw distinctions among these terms by identifying three distinct types of companies with cross-border operations: multinational companies, global companies and international companies. Multinational companies are those that "manage a portfolio of multiple national entities" which are "sensitive and responsive to differences in national environments around the world" (p.14). Global companies "are much more driven by the need for global efficiency, and much more centralized in their strategic and operational decisions" and "treat the world market as an integrated whole" (p.14). International companies, by contrast, retain "considerable influence and control, but less than a classic global company; national units can adapt products and ideas coming from the center, but have less independence and autonomy than multinational subsidiaries" (p.15). The Economist (May 5, 1984) also provided definitions of multinational and global companies that were similar to those as discussed above. Accordingly, multinational, global, and international diversification represent different actions taken by different types of companies. However, the focus of the present study is on the performance implication of diversifying assets overseas. Neither the type of diversification nor the nature of the company was taken into account. The term global diversification was used to mean both multinational and international diversification throughout the study. However, these forms of diversification are substantially different, and these differences are worthy of distinction and comparison.

Thus, global diversification refers to the geographic expansion of a firm's business(es) into foreign countries. In general, global diversification is defined as foreign dispersion of assets while export diversification means foreign dispersion of sales (Miller & Pras, 1980). Such expansion may also include dispersion of sales and production operations abroad.

Global diversification typically benefits a firm by improving operational efficiency through growth in production volume or size, developing new opportunities through entry into prosperous markets abroad and reducing risk through balancing the firm's strategic portfolio (Ansoff, 1984).

The relationship between global diversification and performance has been empirically studied in multiple disciplines. The field of economics has focused on direct foreign investment (DFI), the multinational corporation (MNC), and related theories like oligopolistic competition, market power, international capital arbitrage, and internalization (or transaction costs) (e.g., Caves, 1971; Hymer, 1976; Rugman, 1981; Teece, 1985). The field of finance has mainly focused on international investment portfolios (e.g., Errunza & Senbet, 1984). In contrast, most strategy research has been devoted to identifying the impact of types and modes of diversification and other organizational variables on performance (e.g., Buhner, 1987; Geringer, Beamish & daCosta, 1989; Habib & Busija, 1991; Kim, Hwang & Burger, 1989).

Some research findings suggest that global diversification is significantly related to performance (e.g., Geringer et al., 1989; Grant, 1987; Miller & Pras, 1980). The more globalized a firm is, the better it will perform. Even unrelated diversification, often regarded as the least attractive type of diversification (Christensen & Montgomery, 1981; Rumelt, 1974; Varadarajan & Ramanujam, 1987), can supposedly improve a firm's performance if accompanied by globalization of activities (Kim et al., 1989).

Although it has been examined, several issues involving the association between global diversification and performance have not yet been resolved. First, the relationship between global diversification and performance is still inconclusive. Some studies found that global diversification is positively related to performance (e.g., Buhner, 1987; Geringer et al., 1989), but some did not (e.g., Kumar, 1984; Mirchandani & Lee, 1991).

Second, most research on global diversification is cross-sectional or static, rather than dynamic. The dynamic perspective of the relationship between global diversification and firm performance deals with how changes in the global diversification of a firm over time influences changes in its performance. Grant, Jammine and Thomas (1988) examined the dynamic aspects of product diversification and multinational diversification (which was measured by the ratio of the firm's overseas sales to its total sales) independently; however, their study did not consider the interactive nature of the two types of diversification. Whether the change in global diversification strategy (the integration of both geographic dispersion and product relatedness) is one of the major causes of superior performance over time has yet to be investigated.

Third, global diversification strategy is basically concerned about "what" and "where" a company diversifies. The question of "what" (product relatedness) has been previously examined, but the question of "where" has been restricted to the consideration of home country versus foreign countries (or regions). In fact, different market regions not only may provide different comparative advantages, they also may provide different competitive advantages to different firms (Ohmae, 1985). Few have studied the differences among geographic regions and the influence of these differences on the relationship between diversification and firm performance.

Fourth, global diversification has not been consistently measured. All measures used in the past have been categorical in nature. Nevertheless, when studying the dynamic perspective of diversification strategies, quantitative measures may be more appropriate than qualitative measures (Pitts & Hopkins, 1982). Among different quantitative measures, the entropy measure has been recommended for research on diversification (Chatterjee & Blocher, 1991; Hoskisson, Hitt, Johnson & Moesel, 1991; Kim, 1989; Palepu, 1985). However, the entropy measure of global diversification developed by Kim (1989) is misoriented. Kim's (1989) measure is product-oriented rather than geographic-oriented. The product-oriented measure hinders the measurement of diversification strategies across geographic regions. Moreover, the product-oriented approach creates two basic product strategies of two different natures - one with a geographic concern (i.e., global related diversification or GRD) and the other without (i.e., unrelated diversification or UD). The use of these two strategies without adjusting for their different natures causes problems in research design.

This study seeks to respond to these unresolved issues by investigating the following research questions: What is the relationship between global diversification and performance? Specifically, does dynamic global diversification strategy influence firm performance? How important is geographic location to the dynamic global diversification-performance relationship?

In this study, a new measure of global diversification, based on the entropy concept, was proposed. The new measure, named the Geographic-Oriented Diversification Index (GODI), is based on Kim's (1989) entropy measure of global diversification, but is of a completely different orientation. GODI is geographic-oriented and consisted of three components -- globalization (GLN), global unrelated diversification (GUD) and global related diversification (GRD). While Kim (1989) used unrelated diversification (UD), which is a measure of a firm's diversification in different industries, as the primary component of his entropy measure of global diversification, GODI chooses globalization (GLN), which is a measure of the dispersion of a firm's operations in different geographic regions, as the primary component.

There are several advantages of using GODI for research on global diversification: its continuous nature, its inclusion of a measurement of globalization, and its flexibility in the analysis of data in terms of geographic regions. The feasibility of applying GODI in investigating the dynamic global diversification-performance relationship was examined.

In general, the purposes of this study are:

(1) To investigate the relationship between global diversification and firm performance, particularly from the dynamic perspective.

(2) To determine if the components of global diversification - globalization (GLN), global unrelated diversification (GUD), and global related diversification (GRD) - influence firm performance.

(3) To determine if the geographic market regions influence the dynamic global diversification-performance relationship.

(4) To examine the feasibility of the new measure of global diversification (i.e., GODI) in comparison with two other preceding measures of diversification -- Palepu's (1985)

entropy measure cf diversification and Kim's (1989) entropy measure of global diversification. Particularly, to investigate if the geographic-oriented measure (i.e., GODI) is superior to the product-oriented measures in measuring global diversification.

A sample of U.S. firms from seven manufacturing industries, including both high-tech and low-tech industries, was used for this study. Because of constraints of data availability and time, only data from the years 1984 and 1988 were collected. After eliminating firms with insufficient information, the sample consisted of 174 firms for the year 1984, 189 firms for the year 1988, and 152 firms for both years.

This study mainly contributes to the understanding of global diversification and its influence on firm performance from a dynamic perspective. Moreover, the feasibility test of GODI and the comparison between GODI and other diversification measures provide insights for the further development of measures of global diversification. Besides its academic value, this study is also significant to practitioners. The results may help managers of both MNCs and domestic firms formulate more effective corporate strategies in environments increasingly dominated by global competition.

The remainder of this dissertation will be organized as follows. In Chapter 2, the literature on both product and global diversification will be reviewed. As the focus of this study is on the relationship between global diversification, the shortcomings of recent studies on this respect will be discussed in detail. In Chapter 3, the hypotheses of this study will be developed. Chapters 4 and 5 will show the construction of GODI, the measure of global diversification used in this study, and the methodology of this study, respectively. In Chapter 6, the results, accompanied by more than 90 tables and figures, will be presented. In Chapter 7, the results will be discussed. Additionally, the prospects for future research and the implications for management practice will be suggested. Then, the conclusion of this study will be provided in Chapter 8. At the back, references, appendices and my vita will be attached.

CHAPTER 2 REVIEW OF LITERATURE

Product diversification and global diversification have been two popular streams of research on diversification. Product diversification relates to how firms deploy their resources across lines of business (Rumelt, 1974). On the other hand, global diversification deals with how firms expand their operations in foreign countries (Hitt, Hoskisson & Ireland, 1991). The two diversification strategies are not mutually exclusive. Firms pursuing product diversification may also expand their operations in foreign countries. In this section, research on both product diversification and global diversification is reviewed. Because this study is focused on global diversification, the shortcomings of research on global diversification will be discussed in detail.

The Relationship between Product Diversification and Performance

Early industrial organization economics research showed that diversification is not significantly related to profitability (e.g., Arnould, 1969; Gort, 1962). However, as Rumelt (1974) showed, the insignificant relationship found between diversification and performance was a result of the lack of consideration of business relatedness. Also, the industrial organization economics paradigm overemphasized market power in general and underemphasized the specific skills that give firms advantage in specific market settings (Montgomery, 1985).

By contrast, strategic management researchers emphasize that the direction of corporate growth in terms of market and product is important to developing synergy among a firm's businesses (Ansoff, 1957, 1965; Chatterjee, 1986). The concept of synergy has pervaded strategy research on diversification for decades (e.g., Porter, 1987; Rumelt, 1974). Based on the work of Wrigley (1970), Rumelt (1974) developed a classification scheme of corporate strategies to investigate the relationship between diversification strategy, structure and economic performance. He classified corporate diversification into nine different categories with respect to common core skills, strengths, or resources among a firm's businesses. He found that related-constrained diversification, a strategy in which most of the component businesses of the firm are related to its core business, yielded the highest performance, while unrelated conglomerate diversification resulted in the lowest performance. Rumelt (1974) explained that the outstanding performance of firms following the related diversification strategy was due to the real economic gains available from exploiting core resources. This reasoning has been supported by recent studies (e.g., Christensen & Montgomery, 1981; Palepu, 1985; Varadarajan & Ramanujam, 1987).

Nevertheless, the superiority of the related diversification strategy has been questioned because of the confounding effects of industry structure (Bettis, 1981; Bettis & Hall, 1982; Chang & Thomas, 1989; Christensen & Montgomery, 1981). According to that argument, performance is not mainly affected by relatedness, but rather by industry structure. A firm can be more profitable than another firm simply because the former one operates in an industry which has a higher profitability than the one in which the latter operates. However, Rumelt (1982) pointed out that although the industry effect exists, his previous findings (Rumelt, 1974) of the relationship between product relatedness and performance still hold.

Besides the industry effect, the measurement of performance and other moderators may also affect the relationship between diversification and performance. In the following, these factors are discussed.

The Effect of the Measurement of Performance on the Product Diversification-Performance Relationship

Related diversification is not consistently related to different measures of performance. Michel and Shaked (1984) showed that unrelated diversifiers outperform related diversifiers in terms of market-based measures of risk and return. This is not consistent with studies using accounting-based measures of performance. Although accounting-based measures of performance are historical in nature and market-based measures reflect the market's perceptions of future performance, results based on the two types of measures should be more consistent. If a firm has performed well and is pursuing a diversification strategy that is conducive to superior performance, it should have a reasonably strong balance sheet and income statement as well as a high stock price. However, Dubofsky and Varadarajan (1987) also found that the relationships between diversification and different types of performance measures are conflicting. They remarked that the conflicting results were probably due to the cross-sectional nature of their study.

Fryxell and Barton (1990) followed up the argument on the consistency of accounting- and market-based measures of performance. They found that these measures converge more in unrelated diversification than in related diversification. Furthermore, they pointed out that operating synergy, a major cause of the performance of related diversifiers, is a nonfinancial attribute and is hard to evaluate by investors.

The superior market performance of unrelated diversifiers is also supported by Chatterjee (1986). He pointed out that unrelated conglomerates are better in the creation of market value than related diversifiers. Moreover, he pointed out that unrelated conglomerates are often associated with financial synergy which investors are more ready to recognize than operational synergy in related diversification. The conflicting results between accounting and market measures seem to be inevitable in cross-sectional studies. Although Dubofsky and Varadarajan (1987) suggested that market measures may be reconciled with lagging accounting measures of performance of diversification, such a suggestion has not yet been empirically verified.

Moderators to the Product Diversification-Performance Relationship

The studies of Palepu (1985) and Chatterjee and Wernerfelt (1991) indicated that firms with long-term liquidity tend to diversify into unrelated businesses because high debt capacity may invite takeover attempts. Unrelated diversification may reduce internal funds and help increase stock prices. These actions can defend a firm from takeover.

On the other hand, Amit and Livnat (1988) tried to explain the cause of unrelated diversification by redefining the conglomerate. They defined conglomerates as firms diversifying the effects of the business cycle through the proper selection of business segments. Basically they assumed that firms may intentionally diversify into businesses in different economic sectors and business cycles. They found that conglomerates are characterized by lower profitability and lower variability of profits than nondiversified firms. This indicates that firms diversifying into different businesses with different cycles may enjoy a low operating risk but at the expense of high profits. Such a risk-reduction attempt is also evident in the study of Hill and Hansen (1991). Hill and Hansen (1991) carried out a longitudinal study in the pharmaceutical industry and found that both related and unrelated diversifications induce a negative performance effect. They explained that the negative performance effect is due to the risk-reduction motive for diversification among firms in the industry; even related diversification results in depressed performance under such a risk-reduction, non-efficiency motivation. In addition, Hill and Hansen (1991) also suggested that other management and organizational variables can moderate the relationship between diversification and performance. This is consistent with the suggestion that strategy implementation is important to the relationship between diversification and performance (Hoskisson & Hitt, 1990).

Following the early work of Chandler (1962), Wrigley (1970) and Rumelt (1974), recent studies have found that organizational structure influences the relationship between diversification and performance. Hoskisson (1987) found that the M-form (multi-divisional form) structure improves accounting-based performance in vertically integrated firms pursuing unrelated diversification and vertical integration strategies, but that no improvement is found for related diversified firms. Hoskisson, Harrison, and Dubofsky (1991) extended the work of Hoskisson (1987) with the use of market measures. Hoskisson et al. (1991) found that the M-form implementation by large multiproduct firms will lead to positive risk-adjusted equity returns because investors view the M-form as being more valuable for vertically integrated firms and unrelated diversifiers than for related diversifiers. The findings of Hoskisson (1987) and Hoskisson et al. (1991) are consistent with Williamson's (1975) transaction cost approach which proposes that M-form is appropriate for large diversified firms because it is more efficient than the U-form (functional) structure in internal control, and more efficient than the H-form (holding company) in capital allocation. This indicates that the performance of unrelated diversification can be improved by the use of an appropriate structure. This is consistent with the literature emphasizing the importance of process (Ginsberg, 1990; Jemison & Sitkin, 1986), management and implementation (Hoskisson & Hitt, 1990; Ramanujam & Varadarajan, 1989), and the strategy-structure fit (Miller, 1988) to the success of diversification strategies.

The recent development of the globalization concept has made strategy researchers re-evaluate the relationships between product diversification and performance (Hitt et al., 1991). The interaction effects of product diversification and globalization on performance have been highlighted in several studies (Hitt et al., 1991; Kim et al., 1989; Simmonds, Lamont & Lasseigne, 1991). Unrelated diversifiers may perform as well as related diversifiers by globalizing their operations (Kim et al., 1989). The increasing research on global diversification has reflected the importance of the global aspects of corporate diversification strategies, particularly the interaction effects of product diversification and geographic dispersion on firm performance.

The Relationship between Global Diversification and Performance

Traditionally, global diversification has been deemed to have a positive impact on performance (e.g., Caves, 1982; Rugman, 1979). However, recent research has shown that the relationship between global diversification and performance is not consistent.

Grant (1987) studied a sample of 304 large British manufacturing firms over the period of 1972-1984 and found that profitability among those firms was positively related to the degree of multinationality. Also, he found that increases in overseas production were strongly associated with increases in sales and profitability. Further, he pointed out that the profitability of multinational growth was independent of its destination, supporting the view that the primary source of the superior performance of MNCs was competitive advantage rather than the high rate of profit in the industries of other countries. Based on Grant's (1987) discussion, the competitive advantage of MNCs not only comes from the reduced transaction costs due to internalization of operations, it also comes from returns to the use of intangible, firm-specific assets (particularly technology, various management and organizational skills, and investments in R&D and advertising); market power conferred by international scope (e.g., size and expertise, cross-subsidization to out-gun nationally-based rivals in competition); capacity to undertake risky investments through the risk-spreading nature of the multinational network of operations; and broadening of investment opportunities beyond the home market.

In West Germany, Buhner (1987) examined the performance of international diversification of 40 large firms from a market point of view for the period of 1966-1981. He found that international diversification had a positive impact on both market and accounting measures of performance. These results held after controlling for product diversification and growth. Furthermore, firms with less product diversity which went abroad outperformed diversified firms with similar levels of international diversification. International diversification was also associated with risk-reduction. Buhner (1987) indicated that international diversification is pulled by the need for prospective market opportunities while product diversification is pushed by the motive of risk reduction. Market opportunities are the major source of high performance from international diversification.

Geringer et al. (1989) extended Rumelt's (1974) diversification research to international business. They studied 100 firms from the U.S. and 100 firms from Europe for the period of 1982-1983. They found that the degree of internationalization was positively related to performance; there was no interaction effect between product diversification strategy and degree of internationalization on performance. Moreover, they observed that there was a threshold effect of internationalization on performance. That is, when the degree of internationalization increases above a certain level, the relationship between the degree of internationalization and performance changes from positive to negative. They explained that this is due to over-diversification which goes beyond the capacity of management. A similar relationship between global diversification and performance is also hypothesized by Hitt et al. (1991).

However, Kim et al. (1989) showed that there was an interaction effect between product diversification and international market diversification on firm performance. They found that related diversifiers cannot guarantee both profit growth and stability in international competition. They also found that unrelated diversifiers can achieve favorable performance when diversified internationally. Moreover, international market diversification may provide a firm with profit stability.

Although a number of studies have shown that global diversification is positively related to performance, some studies disagree with such a relationship. Kumar (1984) examined 672 British firms for the period of 1972-1976 and found that after controlling for size and past growth, overseas activity was only weakly related with firm growth or profitability at the industry level. Mirchandani and Lee (1991) also found that multinational diversity had a positive impact on profitability for Japanese and Korean firms but had no impact for U.S. firms. Therefore, the relationship between global diversification and performance is not yet determined.

On the other hand, the literature has consistently shown that global diversification can reduce risk or stabilize performance (Caves, 1982; Miller & Pras, 1980; Rugman, 1976, 1979). Using market measures of performance, Hughes, Logue, and Sweeney (1975) and Michel and Shaked (1986) showed that MNCs had lower level of risk than domestically-focused firms. Miller and Pras (1980) and Kim et al. (1989) also showed that global diversification was related to profit stability. Particularly, Miller and Pras (1980) found that global diversification was, more than export or product diversification, significantly related to profit stability.

The Effect of the Measurement of Performance on the Global Diversification-Performance Relationship

The contradictory results on the impact of product diversification and internationalization on performance from Geringer et al. (1989) and Kim et al. (1989) can be reconciled by comparing the measurement of performance used in those two studies (Simmonds et al., 1991). Geringer et al. (1989) measured performance in terms of profitability measures (standardized five-year averages of

ROS and ROA) and Kim et al. (1989) used profit growth and stability as performance measures. Consistent with Geringer et al. (1989) and Kim et al. (1989), Simmonds et al. (1991) showed that product diversification and internationalization independently influenced profitability measures such as ROA. On the other hand, product diversification and internationalization interacted to influence sales growth and risk-adjusted profitability (or profit stability) measures. This indicates that the impact of the interaction between product diversification and internationalization on performance is dependent on the measures of performance.

In general, most studies of global diversification have focused on its impact on profitability (or the accounting measures of performance). Only a few studies have been devoted to the use of other performance measures such as stock market measures. The study of Hughes et al. (1975), one of the earliest, compared the performance of 46 MNCs with 50 domestically-focused firms for the period of 1970-1973 using various measures of risk and return. They found that MNCs had lower systematic risk (beta) as well as lower unsystematic risk. They also found that the average return of MNCs was higher than the average return of domestically-focused firms. However, in contrast to Hughes et al. (1975), Michel and Shaked (1986) found that domestically-focused firms had superior risk-adjusted performance as well as higher market performance, although the risk reduction effect was the same.

Moderators to the Global Diversification-Performance Relationship

Some moderators are identified in investigating the relationship between global diversification and performance. Major moderators are firm size, industry, and other strategies used by the firm.

Firm size:

Firm size, as a control variable, is common to the studies of global diversification (e.g., Buhner, 1987; Grant et al., 1988; Mirchandani & Lee, 1991). A large firm can afford the fixed costs of overseas production and can more easily obtain financing because large firms, in the eyes of financing institutions, are less risky investments than small firms and can better survive amid the complexities of overseas investment (Caves, 1974; Horst, 1972). Put differently, large firms can often subsidize their foreign operations long enough to reap long-term returns. Miller and Pras (1980) also pointed out that large size confers advantages in financial planning and coordination. Moreover, they indicated that the large asset base of a large firm is always geographically diversified. Experienced international diversifiers tend to have more DFI and more consistently successful results than unexperienced competitors (Anderson & Gatignon, 1986). Therefore, large firms seem to be able to attain a higher level of performance than small firms in the pursuit of global diversification.

Industry:

Another common control variable in the studies of global diversification is industry (e.g., Kumar, 1984; Grant et al., 1988). The effects of industry on the relationship between diversification strategies and performance have already been highlighted by strategy researchers (e.g., Bettis & Hall, 1982; Rumelt, 1982). For global diversification, Grant et al. (1988) showed that the industry affected profitability more than diversification strategies. Similarly, Schmalensee (1985) pointed out that industry effects were far more important than firm effects in determining interfirm differences in performance, particularly in terms of accounting rates of return.

Product diversification:

Product diversification may affect the relationship between global diversification and performance (Hitt et al., 1991). Hitt et al. (1991) argued that most globally diversified firms also operate in multiple and disparate product markets. Therefore, the interaction between global and product diversification is important. Buhner (1987) controlled for product diversification in his study of the relationship between geographic diversification and performance. Kim et al. (1989) showed an interactive effect of both product and global diversification on performance. However, Geringer et al. (1989) found that product diversification and internationalization did not interact to influence performance. Later, Simmonds et al. (1991) indicated that the contradictory results from Kim et al. (1989) and Geringer et al. (1989) could be reconciled by comparisons and adjustments for the ways performance was measured. This indicates that product diversification is a potential moderator to the relationship between global diversification and performance.

Technological intensity:

Technological intensity or firm innovation may affect the relationship between global diversification and performance (Hitt et al., 1991; Kobrin, 1991). Hitt and Hoskisson (1991) pointed out that the development of technology is at the heart of strategic competitiveness. Additionally, Porter (1990) noted that a nation's competitiveness depends on the capacity of its industry to innovate and upgrade. Furthermore, he argued that firms achieve competitive advantage in international markets through innovation. However, Ohmae (1985) suggested that firms may invest overseas for reasons of technology. He asserted that the integration of the technological strengths of different countries are more likely to yield desired results than totally relying on a single country for technological advancement or innovation. Kotabe (1989) showed that U.S. MNCs are increasingly integrating R&D activities on a global scale. Kobrin (1991) also found that technology is the primary determinant of global integration. Besides gaining the technological advantage from global diversification, a firm may improve its profitability by exploiting its technology or management capabilities through the increase in production scale and sales volume from global diversification (Dubin, 1980;

Hamel & Prahalad, 1985; Kogut, 1985; Rugman, 1980). Horst (1972) found that industries with high R&D expenditures tended to have firms with overseas operations above the mean of the sample. Overall, this suggests that a firm may diversify globally for improvement in technology or innovation in order to gain a competitive edge. Also, a firm with technological advantage needs to globally diversify in order to gain economies of scale.

Other potential moderators:

Besides the factors discussed above, organizational structure is another possible moderator to the relationship between global diversification and performance. Hoskisson (1987) found that the M-form (multi-divisional form) structure improved accounting-based performance in firms pursuing unrelated diversification and vertical integration strategies, but that no improvement was found for related diversified firms. Hoskisson et al. (1991) used market-based measures of performance instead of accounting-based measures in the study by Hoskisson (1987). They found that the M-form implementation by large multiproduct firms will lead to positive risk-adjusted equity returns because investors view the M-form as being more valuable for vertical integrative firms and unrelated diversifiers than for related diversifiers. The M-form structure may influence the effectiveness of global diversification because the M-form structure is appropriate for large diversified firms in terms of transaction costs or efficiency (Williamson, 1975). However, Buhner (1987) found that the M-form structure had no effect on the relationship between global diversification and performance, although he did not segregate the sample as Hoskisson (1987) and Hoskisson et al. (1991) did. Therefore, the moderating effect of organizational structure on the relationship between global diversification and performance has not been conclusively determined.

Shortcomings of Recent Empirical Research on Global Diversification-Performance Relationship

Although global diversification has been extensively studied in the past, its relationship with firm performance is still inconclusive. A summary of major empirical studies of global diversification is shown in Table 2.1. The review of these studies shows that there are several shortcomings in research on global diversification. These shortcomings are in the following

Table 2.1 Summary of Major Empirical Studies of Global Diversification

Researcher(s) and Sample	Key Variables	Major Finding(s)
Miller & Pras (1980) Sample: 246 large US firms in 1961, 1965 and 1968.	Dependent: Risk or profit stability (standard deviation in the ratios of net income to assets and operating income to assets). Independent: (1) Product diversification (entropy measure in terms of four-digit SIC codes). (2) Multinational diversification (entropy measure in terms of 7 regions). (3) Export diversification (export to total sales). (4) Others: Firm size (log of assets).	Profit stability is significantly influenced by multinational diversification and firm size, but not export or product diversification.
Kumar (1984) Sample: 672 UK firms during 1972-76.	Dependent: (1) Profitability (average over 1972-76): Return on net assets, ROS. (2) Growth (average over 1972-76): Rate of growth of net assets.	(1) A positive relationship between size and the degree of overseas activity was found. But if firms which had no overseas activity were excluded, the relationship became much weaker.

Table 2.1 (cont.)

	Independent: (1) Degree of overseas activity (percentage of sales originating overseas in 1972). (2) Others: Firm size (sales in 1972), industry, past profitability and growth.	(2) Controlling size and past growth or profitability, there was little relationship at the individual industry level between overseas activity and firm growth or profitability.
Michel & Shaked (1986) Sample: 43 domestic manufacturing firms included in the Fortune 500 and 58 manufacturing MNCs included in the Forbes list of America's 125 MNCs.	Dependent: 3 measures of stock market risk-adjusted performance (Sharpe's, Treynor's, and Jensen's). Independent: (1) Domestic firms vs MNCs. (2) Others: Capitalization, standard deviation of equity, CAPM's beta.	(1) Domestic firms had higher risk-adjusted performance, less capitalization, higher total risk and higher systematic risk than MNCs. (2) MNCs were larger than domestic firms. But size was not significant to the relationship found in (1).

Table 2.1 (cont.)

Buhner (1987) Sample: 40 large firms in West Germany during 1966-81.	Dependent: (1) Profitability: ROA, ROE. (2) Market determined risk-return measures. Independent: (1) International diversification: (a) Herfindahl-type index of sales proportion in 6 market regions. (b) Four classes of Rumelt's measure interacting with the degree of internationalization (high or low) to form a total of 8 categories. (2) Control variables: size and growth, ownership and M-form structure, financial leverage.	(1) Int'l diversification has a positive impact on both market and accounting measures of performance. (2) Int'l diversification induces risk-reducing. (3) Controlling int'l diversification, product diversification has a negative impact on both risk and ROE. (4) Controlling product diversification and growth, international diversification has a positive impact on performance.
Grant (1987) Sample: 304 large British manufacturing firms during 1972-84.	Dependent: (1) Sales growth (2) Profitability: Return on net assets, ROS, ROE. Independent: (1) Multinationality (sales revenue from overseas operating subsidiaries as a	(1) Profitability is positively related to degree of multinationality. (2) Increase in overseas production are strongly associated with increase in sales and profitability.

Table 2.1 (cont.)

	proportion of total firm sales). (2) Region (in terms of Europe, North America, and the rest of the world).	(3) Profitability of multinational growth is independent of destination.
Grant, Jammine & Thomas (1988) Sample: 304 large British manufacturing firms during 1972-84.	Dependent: (1) Profitability: Return on net assets, ROE, ROS. (2) Sales growth. Independent: (1) Product diversity: Rumelt's categorical measure, Herfindahl-type measure. (2) Multinational diversity: Proportion of a firm's revenue derived from operations outside the UK. (3) Control variables: Industry (two-digit SIC codes), firm size, Leverage.	(1) Both product diversity and multinational diversity are related to profitability. (2) The relationship between product diversity and profitability remains positive up to a point, then turns negative when product diversity further increases. (3) There was limited evidence that profitability promotes product diversification. (4) For multinational diversification, profitability in the home market encourages overseas expansion that in turn increases profitability.

Table 2.1 (cont.)

Geringer, Beamish & daCosta (1989) Sample: 100 largest firms each from the US and Europe during 1982-83.	Dependent: Profitability (standardized 5-year average of ROS and ROA during 1977-81). Independent: (1) Diversification strategy (Rumelt's categorical measure). (2) Degree of internationalization (ratio of foreign subsidiaries' sales to firm's total worldwide sales during 1977-1981).	(1) Diversification strategy and internationalization are not interacted. (2) Internationalization is positively related to profitability. (3) Internationalization threshold exists, i.e., performance will drop if over internationalized.
Kim, Hwang & Burgers (1989) Sample: 62 firms during 1982-85.	Dependent: (1) Growth in operating profit margin and ROA. (2) Stability of operating profit margin and ROA. Independent: Global diversification (based on Kim's (1989) entropy measure, 4 classes were formed with respect to the degree of relatedness and the degree of global market diversification.	(1) No guarantee that related diversification achieves favorable performance in both profit growth and stability. (2) Degree of global market diversification is associated with profit stability. (3) Unrelated diversification can be associated with favorable profit performance when diversifying internationally (an interaction of product diversification and internationalization).

Table 2.1 (cont.)

Kotabe (1989) Sample: More than 2,000 US firms during 1977-82.	Dependent: Hollowness (ratio of US manufacturing imports from foreign affiliates of US firms to their total US sales for each industry). Independent: (1) Global competition (relative global market share). (2) R&D intensity of US parents and foreign affiliates. (3) Extents of US parent's internal exports of equipment/components in terms of total sales by US parents.	(1) Proof of gradual globalization of US MNCs. (2) US MNCs are increasingly integrating R&D activities on a global scale. (3) Globally competitive US MNCs have become "hollowers" in their domestic operations.
Simmonds, Lamont & Lasseigne (1991) Sample: 156 US firms during 1975-77.	Dependent: (1) Growth: Average annual sales growth and earnings per share growth. (2) Profitability: Return on invested capital (ROIC), ROA, ROE. (3) Risk-adjusted ROIC (RROIC). Independent: (1) Product diversification (Rumelt's categorical measure)	(1) Product diversification effect on performance is consistent with Montgomery (1979). (2) Internationalization effect was found on ROA and ROIC. (3) Interaction effects were found on sales growth and RROIC.

Table 2.1 (cont.)

	(2) Degree of internationalization (two levels - high or low - depending on ratio of a firm's foreign sales to its total sales, rated high if the ratio is greater than 20%, low if under 20%).	(4) Product diversification strategy may be a necessary but not sufficient explanation of firm performance.
Kobrin (1991) Sample: 56 US manufacturing industries (3-digit SIC code) during 1982-86.	Dependent: Index of global integration (ratio of intra-firm trade to foreign sales). Independent: (1) Internationalization (percentage of total industry sales generated abroad). (2) Technological intensity (ratio of R&D expenses to sales). (3) Market responsiveness or advertising intensity (ratio of advertising expenses to sales). (4) Manufacturing scale or minimum efficient scale (ratio of average employment of the largest plants to total employment in the industry).	(1) Global integration is significantly influenced by technological intensity, market responsiveness and internationalization; but not manufacturing scale. (2) Technology is the primary determinant of global integration and the importance of manufacturing scale has been overemphasized.

Table 2.1 (cont.)

Mirchandani & Lee (1991) Sample: 100 firms each from the US, Japan and South Korea during 1982-86.	Dependent: Profitability (ROE, ROI and ROA). Independent: (1) Product diversity (ratio of sales of the single largest business segment to the total sales of the firm subtracted by 1). (2) Multinational diversity (ratio of foreign sales to total sales). (3) Control variables: Firm size (natural log of assets), capital intensity (ratio of total assets to total sales), debt leverage (ratio of total debt to stockholders' equity).	(1) Increased product diversity had a detrimental impact on profitability for US firms but no impact for Japanese and Korean firms. (2) Japanese and Korean firms were higher in multinational diversity than US firms. (3) Multinational diversity had a positive impact on profitability for Japanese and Korean firms but no impact for US firms.

areas: classification of global diversification, operationalization of global diversification, geographic impact, measurement of performance, potential moderators, dynamic nature of global diversification, and samples used in research. Some of these shortcomings are potential causes to the inconclusive relationship between global diversification and firm performance.

Classification of global diversification:

Global diversification is geographic diversification across national borders (Hitt et al., 1991). The main concern of global diversification is the geographic dispersion of the firm's assets and operations into foreign countries. However, the geographic dimension only describes "where" the firm invests, not in "what" the firm invests. For example, a firm may decide to invest in Italy. Italy is only the target place of the firm's investment, but not the whole strategy. The description of what kind of investment the firm will have in Italy is also needed. Will the investment be in a related business(es), or an unrelated business(es), or both? Therefore, in addition to "where", "what" must be integrated in the classification of global diversification.

Product relatedness would satisfy the requirement of "what" in the definition of global diversification because it describes in what the firm invests. In fact, product relatedness is commonly used in the studies of global diversification (e.g., Buhner, 1987).

Recently, some studies of global diversification have considered the "where" question (Grant, 1987; Kobrin, 1991; Kumar, 1984), some studies considered both "where" and "what" but did not examine their interaction (Grant et al., 1988; Miller & Pras, 1980; Mirchandani & Lee, 1991), and some other studies considered both dimensions as well as their interaction (Buhner, 1987; Geringer et al., 1989; Kim et al., 1989; Simmonds et al., 1991). Most studies including the examination of the interaction of both geographic dispersion and product relatedness reported that the interaction has an effect on performance. This suggests that the interaction is meaningful in the research on global diversification.

Strictly speaking, the research taking "where" and "what" as two non-interactive dimensions simply regards geographic dispersion and product relatedness as two distinct strategies, not a single strategy. Studies considering global diversification as the interaction of geographic dispersion and product relatedness are also problematic. For example, a firm that is involved in a variety of unrelated businesses and has a large proportion of its operations abroad may be classified as a globally unrelated diversifier under the rule of interaction because it is high in both geographic dispersion and unrelated diversification. However, the firm may not actually be a globally unrelated diversifier because it keeps all its unrelated businesses at home and diversifies related businesses abroad. This is not consistent with the meaning of global diversification which integrates both "where" and "what" dimensions.

Operationalization of global diversification:

Here, only the integration of geographic dispersion and product relatedness is considered to be appropriate for measuring global diversification. Therefore, only the operationalization of such a definition is discussed in this section.

In general, geographic dispersion (or internationalization) is operationalized as the ratio of sales revenue from overseas operations to total firm sales (e.g., Grant, 1987; Kumar, 1984) because other data, such as assets, are not always available (Kim et al., 1989). But product relatedness has not been operationalized consistently among empirical studies. Some studies used

Rumelt's (1974) categorical approach (e.g., Geringer et al., 1989; Grant et al., 1988), and some other studies used quantitative measures such as the entropy measure (e.g., Miller & Pras, 1980; Mirchandani & Lee, 1991). However, the use of different measures, in most cases, are not considered as a potential cause of inconsistent results in studying the relationship between global diversification and performance because several recent studies have shown that Rumelt's (1974) categorical measure is strongly correlated with other quantitative measures, particularly the entropy measure (e.g., Chatterjee & Blocher, 1991; Hoskisson, Hitt, Johnson & Moesel, 1991). The key issue is how different studies interpreted the interaction between geographic dispersion and product relatedness.

Buhner (1987), Geringer et al. (1989), and Simmonds et al. (1991) used a similar approach to operationalize global diversification. They took Rumelt's (1974) diversification categories as measures for product relatedness and the ratio of sales of overseas operations to total firm sales as degree of internationalization. Buhner (1987) and Simmonds et al. (1991) then classified the degree of internationalization into either high or low. While Geringer et al. (1989) and Simmonds et al. (1991) considered product relatedness and global dispersion or internationalization as two distinct dimensions, Buhner (1987) combined these two dimensions to form another set of global diversification categories. Buhner (1987) divided each product diversification category into highly internationalized or lowly internationalized.

Kim et al. (1989) used another approach to operationalize global diversification. Their classification is based on Kim's (1989) entropy approach. Kim's (1989) approach generates three components - unrelated diversification (UD), global market diversification (GMD) and global related diversification (GRD). Unrelated diversification (UD) reflects the extent of diversification across industries (measured by two-digit SIC codes); global market diversification (GMD) reflects the extent of geographic dispersion of a firm's operations in different industries; and global related diversification (GRD) reflects the extent of diversification across businesses (measured by four-digit SIC codes) within respective industries in different geographic regions. Kim et al. (1989) employed both UD and GRD to classify a firm's businesses as either related or unrelated. On the other hand, they classified GMD into high or low. Then, as shown in Figure 2.1, they combined product relatedness and GMD to form four categories of

1. Determination of product relatedness:

		UD	
		Low	High
GRD	High	RD	Dropped
	Low	Dropped	UD*

2. Formation of Global Diversification Strategies:

		RD	UD*
GMD	High	HG-RD	HG-UD
	Low	LG-RD	LG-UD

Where UD = Unrelated diversification
RD = Related diversification
GMD = Global market diversification
GRD = Global related diversification

Figure 2.1 Categories of Global Diversification Strategies in the Study of Kim et al. (1989)

global diversification. This is also a categorical measure of global diversification.

Some of the criticisms to Rumelt's (1974) categorical approach also apply here. Montgomery (1982) commented that Rumelt's (1974) categorical approach is not suitable for examining the relationship between variables. The reason is that the categorical nature of diversification types resulting from Rumelt's (1974) approach rules out the use of some versatile parametric statistical analyses. The reliance on categorical approach in recent studies of global diversification may be a cause of the inconclusive relationship between global diversification and firm performance.

For the time being, not a single study has developed a measurement of global diversification with respect to the integration of geographic dispersion and product relatedness.

Geographic impact:

Most recent studies have a common omission: the location of foreign operations. Although Geringer et al. (1989) highlighted that geographic rather than product diversification is important to globalization, they did not investigate the importance of geographic location. Most studies only considered geographic dispersion as high or low (e.g., Buhner, 1987; Kim et al., 1989). Ohmae (1985), however, pointed out that the countries a firm invests in are important to the development of the competitive capability of the firm. He suggested that the triad region (Western Europe, North America and Japan) is important for the technological advancement of a globalized firm. On the other hand, Kogut (1985) suggested that firms with labor-intensive operations may exploit the comparative advantages of different countries by diversifying into countries where unskilled labor is inexpensive. This suggests that the specific countries or regions a firm invests in can affect its performance. Future studies of global diversification must take this issue into account.

Measurement of performance:

One of the potential causes of contrary findings in the study of global diversification is non-comparable measures of performance (Simmonds et al., 1991). Recent research suggests that product diversification and internationalization independently affect profitability measures (e.g., ROA) and interactively affect growth and risk-adjusted profitability measures (Geringer et al., 1989; Kim et al., 1989; Simmonds et al., 1991). Therefore, researchers must be careful in using different aspects of performance in hypothesizing the relationship between global diversification and performance.

Potential moderators:

Firm size, industry and other strategies used by the firm have been identified as potential moderators to the relationship between global diversification and performance. Most studies controlled for firm size by selecting samples of large firms (e.g., Geringer et al., 1989; Grant, 1987; Miller & Pras, 1980). Only a few studies controlled for the effects of industry (e.g., Grant et al., 1988; Kumar, 1984). Most studies considered the effects of product diversification strategies, but not other strategies such as innovation or technology. Firms with high technological intensity may focus on operations in the triad region (Western Europe, North America and Japan) for technology transfer among business units within countries in the region (Ohmae, 1985) and firms with labor-intensive operations may invest in less developed countries for cheaper labor costs (Kogut, 1985). However, empirical studies seldom address this issue. Finally, industry effects and firm innovation may be correlated. That is, firms in some industries will have a higher technological intensity than firms in other industries and these dual conditions may both impact performance. Future study of global diversification must pay attention to these potential moderators in order to eliminate as many of the potential biases to the results as possible.

Dynamic nature (the change in global diversification over time):

Horst (1972) pointed out that a systematic study of the dynamic behavior of firms in DFI must be undertaken. However, global diversification research seldom focuses on this issue. A few studies have been devoted to the investigation of the dynamic influence on performance from product diversity and multinationality separately (Grant, 1987; Grant et al., 1988). Therefore, the dynamic nature of global diversification and its influence on performance have yet to be clearly discerned.

Samples used in research:

Various samples have been used in recent empirical studies of global diversification. Although most researchers have studied U.S. firms, samples from other countries or regions have also been used, for example, Germany (Buhner, 1987), Britain (Grant, 1987; Grant et al., 1988; Kumar, 1984), Europe (Geringer et al., 1989), and Asia (Mirchandani & Lee, 1991). However, most studies used convenience samples and tended to focus on large firms. For example, Grant (1987) studied 304 firms from the 1,000 largest U.K. firms and Geringer et al. (1989) studied 100 firms which were included in Fortune 500. Using convenience samples of large firms makes it easier to collect data but limits the generalizability of the results.

Another problem with the samples used in recent studies is that they consisted of firms from different industries without stratification or controls for the effects of industry. Only a few studies are exceptions (e.g., Grant et al., 1988). As previous discussion suggests, failure to control for industry effects would confound the relationship between global diversification and performance.

Summary of Literature Review

Previous research has consistently showed that product relatedness is related to performance (e.g., Christensen & Montgomery, 1981; Palepu, 1985; Rumelt, 1974). A relatedly diversified firm is considered to be more profitable than an unrelatedly diversified counterpart. But the relatedness-performance relationship is affected by industry (Bettis, 1981), management and implementation (Ramanujam & Varadarajan, 1989), and measurement of performance (Dubofsky & Varadarajan, 1987). Previous research has also showed that unrelated diversification is probably motivated by defensive drives (Chatterjee & Wernerfelt, 1991) and can reduce risk (Hill & Hansen, 1991). Moreover, the performance of unrelatedly diversified firms can be improved by adopting an appropriate organizational structure (Hoskisson, 1987) and/or globalizing the firm's businesses (Kim et al., 1989).

Most global diversification studies have investigated both geographic dispersion and product diversification. But only a few has examined the interaction between these two constructs (e.g., Buhner, 1987; Kim et al., 1989). The relationship between geographic dispersion (or internationalization or multinationality or similar terms in different studies) and performance is not yet determined. Some studies support that geographic dispersion is positively related to performance (e.g., Geringer et al., 1989; Grant, 1987), but some do not (e.g., Mirchandani & Lee, 1991). Similarly, the interactive effects of geographic dispersion and product diversification on performance have not been determined.

Some shortcomings in the studies of global diversification have been discussed. These shortcomings are related to the classification and operationalization of global diversification, geographic impact, measurement of performance, potential moderators, the dynamic nature of global diversification, and the samples used in research.

This study argues that global diversification has been misconceptualized and misoperationalized as merely geographic dispersion or the interaction of geographic dispersion and product relatedness in past studies. Rather, global diversification represents an integration of geographic dispersion and product relatedness. The measurement of global diversification should be consistent with this concept.

Some moderators are identified in investigating the relationship between global diversification and performance. Particularly, firm size and industry have usually been controlled for in research on global diversification (e.g., Grant et al., 1988).

CHAPTER 3 HYPOTHESES

In this chapter, hypotheses on the relationship between global diversification and firm performance will be presented. Although the relationship between the dynamic perspective of global diversification and firm performance is the primary focus of this study, the inconsistent findings on the cross-sectional relationship between global diversification and firm performance in the literature also need to be clarified.

The review of literature suggests that global diversification should integrate two dimensions: geographic and product. Furthermore, product diversification can be divided into related and unrelated diversification. Therefore, the measurement of global diversification is fundamentally based on these dimensions. The development of the measure of global diversification in next chapter will show that global diversification can be measured by three components. These components are globalization (GLN), global unrelated diversification (GUD), and global related diversification (GRD). Globalization (GLN) is the geographic dispersion of a firm's operations among different geographic market areas. Global unrelated diversification (GUD) is the firm's involvement in different broadly defined industries (usually in terms of two-digit SIC industries) in different geographic market areas. Global related diversification (GRD) is the firm's involvement in different narrowly defined industries (usually in terms of four-digit SIC industries) within relatively broadly defined industries (two-digit SIC industries) in different geographic market areas. These three global diversification components were used in formulating the hypotheses for this study.

The Cross-Sectional Relationship between Global Diversification and Firm Performance

The literature on product diversification has shown that firms pursuing related diversification generally outperform firms pursuing unrelated diversification (e.g., Christensen & Montgomery, 1981; Rumelt, 1974). But unrelated diversification is likely to bring forth a lower variability or higher stability in profitability than related diversification (Amit & Livnat, 1988).

On the other hand, the literature on global diversification has pointed out that globalization (geographic dispersion) and global diversification are positively associated with firm performance and risk reduction (or performance stability) (e.g., Buhner, 1987; Grant et al., 1988; Kim et al., 1989). Kim et al. (1989) also indicated that unrelated diversifiers, if globalized, can perform as well as related diversifiers. The improvement in the performance of unrelated diversifiers through globalizing their businesses may be attributed to the increasing economies of scale gained from expanded overseas operations (Kogut, 1985) and the reduction in transaction costs through the creation of an internal capital market (Jones & Hill, 1988). That means globalization may rectify the inferior performance of unrelated diversifiers. But whether globalization can actually reverse the negative relationship between unrelated diversification and firm performance has not yet been examined. Therefore, the relationship between global unrelated diversification and firm performance, although expected to be positive, may in fact be neutral or even negative.

Evidently, global unrelated diversification can help stabilize the firm's performance. But whether globalization can reverse related diversifiers' inferiority in performance stability has not yet been examined. Given previous findings that global diversification in general can stabilize firm performance

(Kim et al., 1989; Miller & Pras, 1980), the relationship between global related diversification and performance stability should be positive; however, the possibility of a neutral or negative relationship cannot be discounted.

In the review of literature, firm performance has generally been operationalized by four different types of measures: (1) profitability (e.g., Buhner, 1987), (2) the stability of profitability (e.g., Kim et al., 1989), (3) sales growth (e.g., Grant et al., 1988), and (4) stock market performance (e.g., Simmonds et al., 1991). In terms of individual performance measure, recent studies have shown that global diversification has a positive influence on profitability (Buhner, 1987), the stability of profitability (Kim et al., 1989), and sales growth (Grant et al., 1988). But the relationship between global diversification and stock market performance has been found positive (Buhner, 1987), negative (Michel & Shaked, 1986), and neutral (Simmonds et al., 1991). Although the relationship between global diversification and stock market performance was hypothesized positive in this study, the possibility of a neutral or negative relationship cannot be discounted.

Based on these findings and previous discussion, the following effects of global diversification components on each type of firm performance are hypothesized.

Hypothesis 1a: The components of global diversification (GLN, GUD, GRD) are positively related to firm profitability.

Hypothesis 1b: The components of global diversification (GLN, GUD, GRD) are positively related to the stability of firm profitability.

Hypothesis 1c: The components of global diversification (GLN, GUD, GRD) are positively related to sales growth.

Hypothesis 1d: The components of global diversification (GLN, GUD, GRD) are positively related to stock market performance.

Interactive Effects of Global Diversification Components on Firm Performance from the Cross-Sectional Perspective

The components of global diversification (GLN, GUD and GRD) may jointly influence the nature of global diversification and hence firm performance. The argument is that if the components are not mutually exclusive and each of them has a positive impact on firm performance, their interactions may have a positive impact on firm performance too. For example, a firm scoring high in both GLN and GUD indicates that it is highly involved in a great number of unrelated industries among different geographic market areas. On the other hand, a firm scoring low in GLN but high in GUD means that it largely diversifies its operations into unrelated industries in one or just a small number of geographic market areas. The firm scoring high in both GLN and GUD may outperform the firm scoring low in GLN but high in GUD because the former one would enjoy the advantages of globalization.

The positive relationships between the interactions of global diversification components and firm performance were expected to pervade all performance measures used in this study. To further investigate these relationships, the following hypotheses are tested:

Hypothesis 2a: The interactive effects of global diversification components (GLN, GUD, GRD) are positively related to firm profitability.

Hypothesis 2b: The interactive effects of global diversification components (GLN, GUD, GRD) are positively related to the stability of firm profitability.

Hypothesis 2c: The interactive effects of global diversification components (GLN, GUD, GRD) are positively related to sales growth.

Hypothesis 2d: The interactive effects of global diversification components (GLN, GUD, GRD) are positively related to stock market performance.

The Dynamic Relationship between Global Diversification and Firm Performance

If global diversification is positively associated with performance, firms with a high level of global diversification would outperform firms with a low level of global diversification. If the cross-sectional relationship between global diversification and firm performance is extended over time, a firm should improve its performance through increasing its global diversification.

The construction of the first set of hypotheses indicates that globalization (GLN), global unrelated diversification (GUD) and global related diversification (GRD) are positively related to profitability and its stability, sales growth, and stock market performance. A firm increasing its involvement in these components over time should improve these performance measures as well. Therefore, it is hypothesized that:

> Hypothesis 3a: Changes in global diversification components (ΔGLN, ΔGUD, ΔGRD) are positively related to changes in firm profitability.

> Hypothesis 3b: Changes in global diversification components (ΔGLN, ΔGUD, ΔGRD) are positively related to changes in the stability of firm profitability.

Hypothesis 3c: Changes in global diversification components (ΔGLN, ΔGUD, ΔGRD) are positively related to changes in sales growth.

Hypothesis 3d: Changes in global diversification components (ΔGLN, ΔGUD, ΔGRD) are positively related to changes in stock market performance.

Interactive Effects of Global Diversification Components on Firm Performance from the Dynamic Perspective

A logical extension of the formulation of the second set of hypotheses is that the interactions of changes in global diversification components influence changes in profitability, the stability of profitability, sales growth, and stock market performance. This leads to the following hypotheses:

Hypothesis 4a: The interactive effects of the changes in global diversification components

(ΔGLN, ΔGUD, ΔGRD) are positively related to changes in firm profitability.

Hypothesis 4b: The interactive effects of the changes in global diversification components (ΔGLN, ΔGUD, ΔGRD) are positively related to changes in the stability of firm profitability.

Hypothesis 4c: The interactive effects of the changes in global diversification components (ΔGLN, ΔGUD, ΔGRD) are positively related to changes in sales growth.

Hypothesis 4d: The interactive effects of the changes in global diversification components (ΔGLN, ΔGUD, ΔGRD) are positively related to changes in stock market performance.

Global Diversification in the Triad Region and Performance of Firms in High-Tech Industries

One of the shortcomings of recent empirical research on global diversification is the neglect of the importance of geographic region. Some studies only distinguished overseas operations from domestic operations (e.g., Grant, 1987; Kumar, 1984). Some other studies divided the world market into different geographic regions (e.g., Kim et al., 1989; Miller & Pras, 1980), but did not fully consider the performance implications of diversification into different geographic regions. Some geographic regions may be critical to the construction of a firm's competitive capability as noted earlier. Ohmae (1985) emphasized that global firms should go to the triad region (Western Europe, North America and Japan) for technological advantage. Particularly, technology- or innovation-oriented firms should acquire a competitive edge through diversifying their operations into these countries.

This indicates that firms operating in high-tech industries should increase their involvement in the triad region in order to improve their performance. Considering the consistency with the hypotheses on the dynamic relationships between global diversification and different performance measures, hypotheses concerning the effects of changes in the components of global diversification in the triad region and their interactions on changes in firm performance are provided below.

Hypothesis 5a: For firms in high-tech industries, changes in the components of global diversification in the triad region (ΔGLNtr, ΔGUDtr, ΔGRDtr) are positively related to changes in firm profitability.

Hypothesis 5b: For firms in high-tech industries, changes in the components of global diversification in the triad region (ΔGLNtr, ΔGUDtr, ΔGRDtr) are positively related to changes in the stability of firm profitability.

Hypothesis 5c: For firms in high-tech industries, changes in the components of global diversification in the triad region (ΔGLNtr, ΔGUDtr, ΔGRDtr) are positively related to changes in sales growth.

Hypothesis 5d: For firms in high-tech industries, changes in the components of global diversification in the triad region (ΔGLNtr, ΔGUDtr, ΔGRDtr) are positively related to changes in stock market performance.

Hypothesis 6a: For firms in high-tech industries, the interactive effects of changes in the components of global diversification in the triad region (ΔGLNtr, ΔGUDtr, ΔGRDtr) are positively related to changes in firm profitability.

Hypothesis 6b: For firms in high-tech industries, the interactive effects of changes in the components of global diversification in the triad region (ΔGLNtr, ΔGUDtr, ΔGRDtr) are positively related to changes in the stability of firm profitability.

Hypothesis 6c: For firms in high-tech industries, the interactive effects of changes in the components of global diversification in the triad region (ΔGLNtr, ΔGUDtr, ΔGRDtr) are positively related to changes in sales growth.

Hypothesis 6d: For firms in high-tech industries, the interactive effects of changes in the components of global diversification in the triad region (ΔGLNtr, ΔGUDtr, ΔGRDtr) are positively related to changes in stock market performance.

Global Diversification in Non-Triad Countries and Performance of Firms in Low-Tech Industries

In contrast to firms in high-tech industries, firms with labor-intensive operations and relying less on research and development activities than high-tech firms, may gain competitive advantages through cost reduction by diversifying their operations into countries where labor is inexpensive (Kogut, 1985). As a matter of fact, firms investing in non-triad countries where labor costs are lower than countries in the triad region to gain such advantages should be able to improve their performance (Kogut, 1985; Porter, 1986). Similar to the discussion in previous sections, changes in the components of global diversification in non-triad countries as well as their interactions should be related to changes in firm performance.

Considering the consistency with the hypotheses on the dynamic relationships between global diversification and different performance measures, this discussion leads to the following hypotheses:

Hypothesis 7a: For firms in low-tech industries, changes in the components of global diversification in non-triad countries (ΔGLNnt, ΔGUDnt, ΔGRDnt) are positively related to changes in firm profitability.

Hypothesis 7b: For firms in low-tech industries, changes in the components of global diversification in non-triad countries (ΔGLNnt, ΔGUDnt, ΔGRDnt) are positively related to changes in the stability of firm profitability.

Hypothesis 7c: For firms in low-tech industries, changes in the components of global diversification in non-triad countries (ΔGLNnt, ΔGUDnt, ΔGRDnt) are positively related to changes in sales growth.

Hypothesis 7d: For firms in low-tech industries, changes in the components of global diversification in non-triad countries (ΔGLNnt, ΔGUDnt, ΔGRDnt) are positively related to changes in stock market performance.

Hypothesis 8a: For firms in low-tech industries, the interactive effects of changes in the components of global diversification in non-triad countries ($\Delta GLNnt$, $\Delta GUDnt$, $\Delta GRDnt$) are positively related to changes in firm profitability.

Hypothesis 8b: For firms in low-tech industries, the interactive effects of changes in the components of global diversification in non-triad countries ($\Delta GLNnt$, $\Delta GUDnt$, $\Delta GRDnt$) are positively related to changes in the stability of firm profitability.

Hypothesis 8c: For firms in low-tech industries, the interactive effects of changes in the components of global diversification in non-triad countries ($\Delta GLNnt$, $\Delta GUDnt$, $\Delta GRDnt$) are positively related to changes in sales growth.

Hypothesis 8d: For firms in low-tech industries, the interactive effects of changes in the components of global diversification in non-triad countries ($\Delta GLNnt$, $\Delta GUDnt$, $\Delta GRDnt$)

are positively related to changes in stock market performance.

Comparisons of Diversification Measures

Few studies have fully acknowledged the importance of the integration of geographic dispersion and product diversity in measuring global diversification. Kim (1989) developed an entropy measure of global diversification by using unrelated diversification (UD) as the primary component. This study argued that geographic orientation is more relevant than product orientation in the measurement of global diversification. A new entropy measure of global diversification, the Geographic-Oriented Diversification Index (GODI), was developed for this study. The detail of the development of GODI will be shown in next chapter.

In this study, GODI is compared with Kim's (1989) entropy measure of global diversification and Palepu's (1985) entropy measure of diversification to determine which measure best explains the impact of corporate diversification strategy on firm performance.

In general, Kim's measure and Palepu's measure have their respective strengths and weaknesses in dealing with global diversification. As discussed earlier, Kim's measure is misleading in orientation. On the other hand, Palepu's measure only highlights the relatedness of diversification; it does not account for the geographic dispersion of diversification activities. Therefore, GODI is deemed to be superior to Kim's and Palepu's measures because of its appropriate orientation toward geographic dispersion. The superiority of GODI is expected in both cross-sectional and dynamic analyses as the following hypotheses indicate.

> Hypothesis 9a: The components of GODI (GLN, GUD, GRD) explain more of the variance in firm profitability than those of Kim's global diversification measure (UD, GMD, GRD).

> Hypothesis 9b: The components of GODI (GLN, GUD, GRD) explain more of the variance in the stability of firm profitability than those of Kim's global diversification measure (UD, GMD, GRD).

> Hypothesis 9c: The components of GODI (GLN, GUD, GRD) explain more of the variance in sales

growth than those of Kim's global diversification measure (UD, GMD, GRD).

Hypothesis 9d: The components of GODI (GLN, GUD, GRD) explain more of the variance in stock market performance than those of Kim's global diversification measure (UD, GMD, GRD).

Hypothesis 10a: The components of GODI (GLN, GUD, GRD) explain more of the variance in firm profitability than those of Palepu's diversification measure (UD, RD).

Hypothesis 10b: The components of GODI (GLN, GUD, GRD) explain more of the variance in the stability of firm profitability than those of Palepu's diversification measure (UD, RD).

Hypothesis 10c: The components of GODI (GLN, GUD, GRD) explain more of the variance in sales growth than those of Palepu's diversification measure (UD, RD).

Hypothesis 10d: The components of GODI (GLN, GUD, GRD) explain more of the variance in stock market performance than those of Palepu's diversification measure (UD, RD).

Hypothesis 11a: Changes in the components of GODI (ΔGLN, ΔGUD, ΔGRD) explain more of the variance in changes in firm profitability than that of Kim's global diversification measure (ΔUD, ΔGMD, ΔGRD).

Hypothesis 11b: Changes in the components of GODI (ΔGLN, ΔGUD, ΔGRD) explain more of the variance in changes in the stability of firm profitability than that of Kim's global diversification measure (ΔUD, ΔGMD, ΔGRD).

Hypothesis 11c: Changes in the components of GODI (ΔGLN, ΔGUD, ΔGRD) explain more of the variance in changes in sales growth than that of Kim's global diversification measure (ΔUD, ΔGMD, ΔGRD).

Hypothesis 11d: Changes in the components of GODI (ΔGLN, ΔGUD, ΔGRD) explain more of the variance in changes in stock market performance than that of Kim's global diversification measure (ΔUD, ΔGMD, ΔGRD).

Hypothesis 12a: Changes in the components of GODI (ΔGLN, ΔGUD, ΔGRD) explain more of the variance in changes in firm profitability than that of Palepu's diversification measure (ΔUD, ΔRD).

Hypothesis 12b: Changes in the components of GODI (ΔGLN, ΔGUD, ΔGRD) explain more of the variance in changes in the stability of firm profitability than that of Palepu's diversification measure (ΔUD, ΔRD).

Hypothesis 12c: Changes in the components of GODI (ΔGLN, ΔGUD, ΔGRD) explain more of the variance in changes in sales growth than that of Palepu's diversification measure (ΔUD, ΔRD).

Hypothesis 12d: Changes in the components of GODI (ΔGLN, ΔGUD, ΔGRD) explain more of the variance in changes in stock market performance than that of Palepu's diversification measure (ΔUD, ΔRD).

CHAPTER 4 A NEW MEASURE OF GLOBAL DIVERSIFICATION

The measurement of diversification can be either categorical or continuous. The development of categorical measures of diversification is mainly attributed to the work of Wrigley (1971) and Rumelt (1974) and the use of continuous measures can be traced back to Gort's (1962) product-count measure and Jacquemin and Berry's (1979) entropy measure. While Rumelt's categorical measures are still being used (e.g., Lubatkin & Chatterjee, 1991), continuous measures have been increasingly found in the diversification literature because they are typically easier to compute and analyze (Chatterjee & Blocher, 1991).

Although continuous measures are easy to compute, they are criticized for being less descriptive than categorical measures (Pitts & Hopkins, 1982). However, a series of inquiries into the construct validity of continuous measures of diversification has shown that they be more similar to categorical measures than originally thought (Montgomery, 1982). In addition, most continuous measures demonstrate acceptable convergent, discriminant and criterion validity (Chatterjee & Blocher, 1991; Hoskisson et al., 1991).

Comparing the practicality among different continuous measures, Chatterjee and Blocher (1991) and Hoskisson et al. (1991) both recommended the entropy measure for future research in examining diversification strategy because the entropy measure seems to have the greatest explanatory power (Hoskisson et al., 1991) and superior consistency in both discriminant and predictive validity tests (Chatterjee & Blocher, 1991). Moreover, recent research suggests that the entropy measure is the most useful continuous measure of diversification for studying within group variance since it can be split up into related and unrelated diversification (Chatterjee & Blocher, 1991).

For global diversification, Kim (1989) developed an entropy measure which was used in the study of Kim et al. (1989). However, as noted in the previous chapter, Kim's (1989) entropy measure of global diversification is also faulted in orientation and practicality.

Kim's (1989) Entropy Measure of Global Diversification

The Jacquemin-Berry entropy measure (Jacquemin & Berry, 1979) is a SIC-based, continuous measure of diversification. It is based on the number of product segments in which the firm operates, the distribution of the firm's total sales across the product segments and the degree of relatedness among the various product segments (Jacquemin & Berry, 1979). In comparison with other continuous measures (e.g., Gort's [1962] product-count measure), the entropy measure is superior because it not only retains the computational simplicity, but also "allows the decomposition of a firm's total diversity into two additive components: (1) an 'unrelated' component that measures the extent to which a firm's output is distributed in products across unrelated industry groups and (2) a related component that measures the distribution of the output among related products within the industry groups" (Palepu, 1985, p.244).

Based on the work of Jacquemin and Berry (1979) and Palepu (1985), Kim (1989) extended the concept of entropy to measure global diversification. In constructing the entropy measure of global diversification, Kim (1989) chose unrelated diversification (UD) as the primary component because he thought that the primary focus of a firm is the industries in which it operates. The second component is global market diversification (GMD). GMD is designed to capture the global market dispersion effect of a firm's operations. In other words, GMD measures where (or which market areas) the unrelated businesses are located. The third component is global related diversification (GRD) which is designed to capture the effect of global diversification across related businesses (four-digit SIC industries) within a broader defined industry (two-digit SIC industry). The mathematical expression of this measure is shown in Appendix A.

Kim (1989) discussed another approach to developing the entropy measure of global diversification. The alternative approach is to treat geographic market areas as the primary component of the measure. He discarded this alternative because "it treats a firm with multiple industries, each located in a different market area, as having no unrelated industry diversification. This not only is counterintuitive but also constitutes a significant departure from the established conceptualization of unrelated diversification in the literature" (p.378-379). He further defended his measure by indicating that, although the UD component does not consider the locational effect of industries, "the difference in the extent of the two firms' global diversification is not overlooked, but captured in the GRD component of the measure" (p.379). The rationale for this treatment is that "the extent of the unrelatedness of a firm's industries remains similar irrespective of the way the industries are distributed across market areas. For example, whether a firm's electronics and food industry are located in the same international market area or each located in a different market area, the extent of their unrelatedness remains similar" (p.379).

At first glance, Kim's (1989) entropy measure of global diversification may suit the need of this study. However, there are three critical shortcomings in Kim's (1989) entropy measure.

First, Kim (1989) argued that if the primary component of the entropy measure of global diversification is geographic dispersion, instead of UD, then the measure cannot detect the activities of UD of the firms which compete in multiple industries, each located in a different market area. The mathematical proof is shown in Appendix B. However, if Kim's (1989) measure is used to measure the global diversification of the same set of firms described above (i.e., firms competing in multiple industries, each located in a different market area), then the second component GMD of Kim's measure will become zero, indicating no geographic dispersion. The mathematical expression of this is also shown in Appendix B. If the situation is more extreme, that is, the firm only competes in one product in each market area, then GRD will become zero too. The illustration is also shown in

Appendix B. This shows that different limitations exist for different approaches to constructing the entropy measure of global diversification. The above discussion indicates that Kim's (1989) measure is more accurate in identifying the unrelated business activities than the geographic dispersion of the businesses of a firm. However, this orientation seems inappropriate for measuring global diversification because the focus of globalization is geographic rather than product diversification (Geringer et al., 1989). If a firm really competes in multiple industries, each located in a different market area, it would imply that the firm is exploiting the comparative advantages of different market areas where different industries are located. Therefore, detecting such geographic advantage the firm may acquire would seem to be more important than knowing in which industries the firm invests. Moreover, if a measure cannot accurately detect geographic dispersion, how can this measure be called a measure of global diversification? Kim's (1989) orientation in developing his measure of global diversification is, therefore, considered inappropriate.

Second, the bias in the orientation of Kim's (1989) measure is reflected in research using his measure. Kim et al. (1989) used the UD and GRD components to classify a firm's business activities as related (high GRD and low UD) or unrelated (high UD and low GRD); and the GMD component to classify the global market diversification of a firm's business activities as high or low. Then the product diversification dimension and the global market diversification dimension, each divided into two levels, interact to form four categories of global diversification. These four categories are shown in Figure 2.1. Therefore, the actual use of Kim's (1989) entropy measure is in the form of categories, not continuous scales. The comments on the categorical approach in previous sections certainly apply here. Moreover, Kim et al. (1989) measured global diversification as the interaction of global market diversification (GMD) and product relatedness, not the integration of them. This is not consistent with the concept of global diversification that emphasizes the integration of geographic dispersion and product relatedness.

Third, Kim (1989) did not generate a proper categorical classification system as found in the study of Kim et al. (1989). As Chrisman, Hofer, and Boulton (1988) noted, "the taxa of a classification system at all categorical levels must be (a) mutually exclusive, (b) internally homogeneous, (c) collectively exhaustive, (d) stable, and (e) based on relevant language or names" (p.416). However, the classification system generated by Kim's (1989) measure cannot satisfy the requirement of being collectively exhaustive. The classification system used in the study of Kim et al. (1989) neglected nondiversifiers and dual-strategy diversifiers (i.e., high in both related and unrelated diversification). A strategy classification system which is missing some known strategies is not collectively exhaustive (Chrisman et al., 1988). A non-exhaustive measure is not very useful to empirical research (McKelvey, 1982).

Constructing a New Entropy Measure of Global Diversification

The new measure constructed below is an alternative to Kim's (1989) entropy measure of global diversification. This alternative, similar to Kim's (1989) measure, is also an extension of the work of Jacquemin and Berry (1979) and Palepu (1985). The new measure is named the Geographic-Oriented Diversification Index (GODI). GODI is constructed to measure the total global diversification (TGD) of a firm. The new measure selects geographic dispersion or globalization (GLN) as the primary component. Other components are global unrelated diversification (GUD) and global related diversification (GRD).

The entropy concept of diversification is based on the studies of Jacquemin and Berry (1979) and Palepu (1985). The total diversification is based on the dispersion of businesses among four-digit SIC industries. Specifically, unrelated diversification is based on the dispersion of businesses among two-digit SIC industries (broader defined industries than four-digit SIC industries) while related diversification is based on the dispersion of businesses among four-digit SIC industries within each two-digit SIC industry.

The presentation of the construction of GODI is similar to Kim's (1989) approach. All components of GODI, including TGD, GLN, GUD and GRD, will be sequentially presented as follows.

Total global diversification (TGD):

TGD can be described by the dispersion of a firm's operations in any four-digit SIC industries within their respective two-digit SIC industries among different geographic market areas. The entropy measure of a firm's TGD can be defined as:

$$TGD = \sum_{a=1}^{N} \sum_{j \epsilon a} \sum_{i \epsilon j} P_{aji} \ln(1/P_{aji}) \qquad (4.1)$$

where N is the number of geographic market areas in which a firm operates, and P_{aji} is the proportion of the size of the ith four-digit SIC industry within the jth two-digit SIC industry in the ath market area to a firm's total size of operations. According to Kim's (1989) discussion, the size of a firm's operations can be measured by its values of sales, number of employees, or value of assets.

Globalization (GLN):

As the new measure, GODI, is a geographic-oriented measure of diversification, GLN becomes the first component of the measure. GLN is the geographic dispersion of a firm's operations among different geographic market areas. The entropy measure of a firm's GLN is defined as:

$$GLN = \sum_{a=1}^{N} P_a \ln(1/P_a) \qquad (4.2)$$

where P_a is the proportion of the size of a firm's operations in the ath market area to a firm's total size of operations.

Global unrelated diversification (GUD):

Following the sequence of entropy measure, that is from a broad defined topic to a relatively narrower topic, GUD is the second component. GUD is the firm's involvement in different broadly defined industries (two-digit SIC industries) in different geographic market areas. The entropy measure of a firm's GUD is defined as:

$$GUD = \sum_{a=1}^{N} P_a \sum_{j \epsilon a} P_{aj}^{a} \ln(1/P_{aj}^{a}) \tag{4.3}$$

$$\text{where} \qquad P_{aj}^{a} = P_{aj}/P_a \tag{4.4}$$

and P_{aj}^{a} is the proportion of the size of a firm's operations in the jth two-digit SIC industry within the ath market area to a firm's total size of operations, and P_{aj} is the proportion of the size of a firm's operations in the jth two-digit SIC industry within the ath market area to the total size of a firm's operations in ath market area.

Global related diversification (GRD):

The last component is GRD. Similar to Jacquemin and Berry (1979) and Palepu (1985), unrelated diversification is followed by related diversification because related diversification is concerned about operations in more narrowly defined industries than unrelated diversification. GRD describes a firm's involvement in different narrowly defined industries (four-digit SIC industries) within relatively broadly defined industries (two-digit SIC industries) in different geographic market areas. The entropy measure of GRD is defined as:

$$GRD = \sum_{a=1}^{N} P_a \sum_{j \epsilon a} P_{aj}^{a} \sum_{i \epsilon j} P_{aji}^{aj} \ln(1/P_{aji}^{aj}) \qquad (4.5)$$

$$\text{where} \qquad P_{aji}^{aj} = P_{aji}/P_{aj} \qquad (4.6)$$

and P_{aji}^{aj} is the proportion of the size of a firm's operations in the ith four-digit SIC industry within the jth two-digit SIC industry in the ath market area to the total size of a firm's operations, and P_{aji} is the proportion of the size of a firm's operations in the ith four-digit SIC industry within the jth two-digit SIC industry in the ath market area to the total size of a firm's operations in the jth industry in the ath market area.

Equivalence between both sides of the equation:

The entropy concept requires that TGD is equivalent to the sum of its components. It is

$$TGD = GLN + GUD + GRD \qquad (4.7)$$

The mathematical proof of this equivalence is shown in Appendix C.

Comparison between GODI and Palepu's Entropy Diversification Measure

One of the characteristics of GODI is the consideration of geographic dispersion in diversification strategy. If the geographic factor is removed, GODI could be reduced to Palepu's entropy measure of diversification. In this case, it is assumed that the firm operates in one market area, or $N = 1$. Therefore, GLN becomes zero and GUD and GRD are reduced to UD (unrelated diversification) and RD (related diversification), respectively, as shown in the studies of Jacquemin and Berry (1979) and Palepu (1985). The mathematical work is shown in Appendix D. This shows that GODI is comparable with its original form.

Advantages of Using GODI in Global Diversification Research

Besides the strengths of using a continuous measure, particularly the entropy measure, discussed in previous sections, GODI has several advantages over other measures used in previous global diversification research. First, GODI is a continuous measure of global diversification which emphasizes geographic dispersion and makes both geographic concern and product diversification interact within the measure. All other measures used in previous studies are categorical and are deemed inappropriate for comparison over time. Moreover, some measures of global diversification only measure geographic dispersion (e.g., Grant et al., 1988). But in GODI, both GUD and GRD are based on the interaction between geographic dispersion and different product diversification strategies.

Second, GODI includes globalization as one of its components. Most past studies measured globalization because it is a simple and clear indicator of the geographic dispersion of a firm's operations.

Third, the structure of GUD and GRD permits a breakdown of these two components by geographic market area. This enables further analysis of different types of diversification strategies in different geographic market regions. For example, GUD can be broken down into domestic unrelated diversification (DUD) and overseas unrelated diversification (OUD) or unrelated diversification in any particular geographic market areas of interest to the research. The mathematical illustration is shown in Appendix E. These subcomponents of GUD help researcher(s) investigate the development of unrelated diversification in different geographic market areas. Such flexibility in measuring global diversification has not been developed in the past.

Limitations of GODI

As discussed above, GODI is insensitive to some extreme cases such as distribution of different unrelated industries in different geographic market areas. The discussion above shows that Kim's (1989) measure also has the same problem. This seems to be a limitation of any entropy measure of global diversification, including GODI.

Another limitation of using GODI is related to its dependence on the SIC classification. SIC-based measures are not completely objective because there is still no single principle in developing SIC classification (Dubofsky & Varadarajan, 1987). Moreover, SIC-based measures are criticized for their over-emphasis on sales data because in some cases the segment sales data may be unavailable (Varadarajan & Ramanujam, 1987). However, the SIC classification is frequently used in research because it is a well accepted. Furthermore, being the only comprehensive classification of industries available in the public-domain, the analyses carried out in the research can be replicated by others (Palepu, 1985).

CHAPTER 5 METHODOLOGY

This chapter discusses the research procedures used to test the hypotheses discussed in Chapter 3. These procedures, including sampling, defining variables, and selecting methods of analysis, will be introduced in the following sections.

Sample

U.S. manufacturing firms were selected as subjects of this study. A sample of manufacturing firms ensures comparability with previous studies (Kobrin, 1991). Only manufacturing firms (SIC 20 to 39) identified by Standard and Poor's COMPUSTAT industrial file (which contains more than 1,000 manufacturing firms) were considered for this study because COMPUSTAT could provide detailed financial information about them.

The constraint on time made this study focus on a smaller sample of firms rather than all manufacturing firms listed in COMPUSTAT. Based on the estimate of time required for data collection, i.e., about two hours for a firm, a feasible number of firms to start with was about

300. The start-up sample was then selected with respect to the following procedures:

(1) The selection should be primarily based on the industry level because high-tech as well as low-tech industries were required for the study. Therefore, the size of the start-up sample was split between these two types of industries, i.e., about 150 firms in high-tech industries and another 150 in low-tech industries.

(2) Industries that had an average firm ratio of research and development expenses to total sales of at least 3% for each year for the period 1982-90 were considered as high-tech industries; others were considered as low-tech industries.

(3) The industries selected should include MNCs in order to provide a reasonable number of MNCs for analysis. For example, the paper industry (SIC 26) was believed to have more MNCs than the food industry (SIC 20). Therefore, the paper industry was preferable to the food industry in sample selection.

The start-up sample was made up of 324 firms from 7 industries. Specifically, 25 firms in the textile industry (SIC 22), 22 firms in the apparel industry (SIC 23), 35 firms in the paper industry (SIC 26), 25 firms in the rubber and plastics industry (SIC 30), 47 firms in the fabricated metal industry (SIC 34), 102 firms in the electrical and electronic equipment industry (SIC 36), and 68 firms in the instrument industry (SIC 38) were selected. Among these industries, the electrical and electronic equipment industry (SIC 36) and the instrument industry (SIC 38) were considered as high-tech industries while others were considered as low-tech industries. The average firm ratios of research and development expenses to total sales of each selected industry for each year for the period 1982-90 are shown in Table 5.1.

Dun and Bradstreet's America's Corporate Families (for subsidiaries in the U.S.) and America's Corporate Families and International Affiliates (for subsidiaries in foreign countries) and annual reports available on NAARS database provided information about product and geographic dispersion of the firm's assets for this study. In addition, COMPUSTAT supplied the financial information on the sampled firms.

The years for examining global diversification in this study were 1984 and 1988. The year 1984 was the

Table 5.1 Industry Average Ratio of R&D Expenses to Total Sales of Selected Industries for the Period 1982-90

SIC code	Year	N	Industry Average Ratio of R&D Expenses to Total Sales (in %)
22*	82	24	.617
	83	26	.500
	84	25	.642
	85	26	.564
	86	29	.728
	87	30	.606
	88	29	.616
	89	29	.687
	90	29	.741
23	82	21	.029
	83	21	.072
	84	22	.062
	85	25	.049
	86	26	.050
	87	27	.039
	88	28	.036
	89	29	.030
	90	31	.037
26	82	31	.790
	83	34	.715
	84	35	.682
	85	36	.773
	86	37	.756
	87	37	.744
	88	38	.692
	89	38	.708
	90	39	.653

* SIC 22 = Textile industry
SIC 23 = Apparel industry
SIC 26 = Paper industry
SIC 30 = Rubber & plastics industry
SIC 34 = Fabricated metal industry
SIC 36 = Electrical & electronic equipment industry
SIC 38 = Instrument industry

Table 5.1 (cont.)

SIC code	Year	N	Industry Average Ratio of R&D Expenses to Total Sales (in %)
30	82	24	.856
	83	24	.871
	84	25	.833
	85	28	.898
	86	30	.840
	87	32	.786
	88	33	.833
	89	34	2.975
	90	34	.780
34	82	46	.708
	83	47	.873
	84	47	.918
	85	47	.863
	86	46	.788
	87	48	.697
	88	49	.645
	89	51	.705
	90	52	.693
36	82	49	4.258
	83	101	3.908
	84	102	6.435
	85	104	7.670
	86	110	7.010
	87	116	4.662
	88	116	4.451
	89	121	4.849
	90	125	18.144
38	82	65	4.876
	83	67	4.996
	84	68	5.337
	85	70	5.977
	86	74	5.115
	87	77	9.976
	88	77	14.120
	89	83	10.164
	90	88	6.610

earliest for which records on the current NAARS database were available for this study. On the other hand, 1988 was selected as the end year because the most recent data from COMPUSTAT available for this study was 1990 and the performance was measured by three-year lagging measures.

After eliminating those firms with insufficient information, there were 174 firms for the year 1984, 189 firms for the year 1988, and 152 firms for both years. The distribution of the sampled firms by year and by industry is shown in Table 5.2.

Variables

Global diversification:

The Geographic-Oriented Diversification Index (GODI) was the key measure of global diversification. As noted by Kim et al. (1989), sales revenue and number of employees are common indicators of the size of operations because information of overseas assets is not often available. However, in this study, product and geographic distribution of a firm's assets could be estimated from Dun and Bradstreet's publications and NAARS database. Therefore, the size of operations was measured by assets

Table 5.2 Mean Size (i.e., in Assets) and Distribution of Sampled Firms by Industry

A. Sample for the year 1984

Industry SIC code	N	Mean Assets* (S.D.)	Minimum	Maximum
22	11	382(377)	67.307	995.329
23	10	300(350)	36.250	1167.209
26	17	2054(2057)	33.402	6560.680
30	12	837(2032)	21.037	7252.418
34	30	403(506)	13.908	2329.499
36	51	1099(4043)	8.379	28584.332
38	43	974(2411)	18.886	11940.668
Total	174	932(2659)	8.379	28584.332

* in $million.

B. Sample for the year 1988

Industry SIC code	N	Mean Assets* (S.D.)	Minimum	Maximum
22	8	413(417)	53.391	1169.260
23	9	280(238)	39.650	801.416
26	21	3056(2980)	48.880	11571.000
30	17	1015(2039)	22.594	8680.730
34	31	595(723)	26.209	3217.732
36	57	895(1669)	9.673	7712.664
38	46	1774(5475)	19.358	29341.332
Total	189	1261(3165)	9.673	29341.332

* in $million.

Table 5.2 (cont.)

C. Sample for the period 1984-88 -- Assets in 1984

Industry SIC code	N	Mean Assets* (S.D.)	Minimum	Maximum
22	7	410(368)	67.307	893.035
23	8	220(189)	36.250	634.776
26	17	2054(2057)	33.402	6560.680
30	12	837(2033)	31.037	7252.418
34	26	412(507)	13.908	2329.499
36	42	612(1028)	8.379	4415.332
38	40	1039(2490)	18.886	11940.668
Total	152	836(1707)	8.379	11940.668

* in $million.

D. Sample for the period 1984-88 -- Assets in 1988

Industry SIC code	N	Mean Assets* (S.D.)	Minimum	Maximum
22	7	464(422)	53.391	1169.260
23	8	311(235)	91.221	801.416
26	17	3199(3152)	48.880	11571.000
30	12	1160(2423)	22.594	8680.730
34	26	646(767)	26.209	3217.732
36	42	918(1754)	13.559	7712.664
38	40	2010(5843)	19.358	29341.332
Total	152	1376(3446)	13.559	29341.332

* in $million

which are more relevant than other measures to represent a firm's involvement in a particular geographic region.

The distinction between related diversification and unrelated diversification was in terms of four-digit and two-digit SIC codes. Diversification across four-digit SIC industries within a broader defined two-digit SIC industry was referred to as related diversification while diversification across two-digit SIC industries is referred to as unrelated diversification (Jacquemin & Berry, 1979; Palepu, 1985).

Following Hirsch and Lev (1971), Miller and Pras (1980) and Kim et al. (1989), regional groupings of countries were used for measuring geographic market areas. Regional groupings of countries are a relevant geographic unit which patterns of general economic conditions, fluctuations in demand and external restrictions display close similarities (Miller & Pras, 1980). Groupings of countries can simplify the measurement of diversification in different geographic areas. Also they help researchers to focus on a specific geographic area easily. Although Vachani (1991) suggested that diversification into countries within the same region may have meaning to global diversification, the use of individual countries as geographic units was dropped because it would unnecessarily complicate the measurement of global diversification in this study. Thus, thirteen relatively homogeneous geographic regions were formed with consideration of economic and political conditions. These thirteen regions are: the U.S. (including its possessions), Canada, Japan, EEC countries, non-EEC developed European countries, other developed countries, African countries (except South Africa), the four Asian dragons, other developing Asian countries, Mexico, Latin American countries, Middle East countries (except Israel) and Eastern Bloc countries. The detail listing of countries included in this grouping is shown in Table 5.3.

In this study, the first five geographic regions - the U.S., Canada, Japan, EEC countries and non-EEC developed European countries - will represent the so-called triad region, according to the suggestion of Ohmae (1985). The computation of all global diversification components was based on the proportion of assets located in different industries and different geographic regions. Estimates were used in this study because the data were not reported directly in any publicly available sources. The estimates of assets allocation of each firm by industry and geographic region were based on the information provided by Dun and Bradstreet's publications and annual reports. An illustration of the procedures used to compute the estimates is shown in Appendix F.

Table 5.3 List of Countries by Geographic Region

Region 1	The U.S. (including its possessions)
Region 2	Canada
Region 3	Japan
Region 4	EEC countries: Belgium & Luxembourg, Denmark, France, Germany, Greece, Ireland, Italy, Netherlands, U.K.
Region 5	Non-EEC developed European countries: Austria, Finland, Norway, Portugal, Spain, Sweden, Switzerland
Region 6	Other developed countries: Australia, Israel, New Zealand, South Africa
Region 7	African countries (except S. Africa): Algeria, Egypt, Ethiopia, Ghana, Kenya, Liberia, Libya, Morocco, Nigeria, Senegal, Sudan, Tunisia, Zaire, Zambia, Zimbabwe
Region 8	Four Asian dragons: Hong Kong, South Korea, Singapore, Taiwan
Region 9	Other developing Asian countries: China, India, Indonesia, Malaysia, Pakistan, Philippines, Sri Lanka, Thailand
Region 10	Mexico
Region 11	Latin American countries: Argentina, Bahamas, Bermuda, Brazil, Chile, Colombia, Ecuador, Guyana, Jamaica, Netherlands Antilles, Panama, Paraguay, Peru, Trinidad & Tobago, Uruguay, Venezuela
Region 12	Middle East countries: Iran, Turkey, Jordan, Kuwait, Lebanon, Saudi Arabia, Syria, United Arab Emirates
Region 13	Eastern Bloc countries: U.S.S.R., Eastern Bloc

Firm performance:

Performance is a multidimensional construct because it cannot be fully represented by one measure only (Steers, 1977). In this study, four different types of measures were used to capture the performance of a firm. They were profitability, the stability of profitability, sales growth, and stock market performance. Profitability of a firm was measured by return on assets (ROA) and return on sales (ROS) in percentage. ROA is a popular measure of profitability (e.g., Buhner, 1987; Geringer et al., 1989) because it represents the efficiency of using a firm's assets. ROS was also used to measure profitability because it can represent the synergy of operations. If a firm really achieves synergies in business operations through diversification, it would improve its return on sales. Moreover, sales are in more current monetary terms than assets; therefore, ROS is less affected by different methods of depreciation and major new investments (Geringer et al., 1989).

The stability of profitability was measured by the variability (in terms of standard deviation) of ROA (SdROA) and ROS (SdROS) over the lagged three-year period.

Sales growth (SG) of a firm was measured by its annual percentage growth in sales. The reason for using sales growth for measuring performance is that if diversification fails to generate extra profitability, growth rather than profitability may be the principal motivator of diversification (Marris, 1967; Grant et al., 1988). Therefore, sales growth was used as one of the measures of firm performance in this study.

Stock market performance was measured by the ratio of the stock price at the close of the fiscal year to that of the previous year (PR). If investors expect that a firm will provide a favorable return in the future, its market price will increase accordingly.

All performance measures described above, except the stability of profitability, were measured on a lagging three-year average basis. Profit measures are often averaged over several years to eliminate the influence of short-term factors (Grant, 1987). The lagging measure can also capture the long-term effect of strategy. However, the length of the period used for averaging is arbitrary. In this study, a period of three years was used for measuring the performance of a global diversification strategy. A three-year period was considered to be long enough to measure the true effect of strategy, yet short enough not to be seriously biased by effects of strategic changes. For example, in measuring the performance of the global diversification strategy in 1984, the average of performance in 1984, 1985 and 1986 was used. Similar calculation was applied for the year of 1988.

Moreover, all performance measures were adjusted by subtracting the average performance of all firms in the industry. This reduces industry effect on a firm's performance. Another way of adjustment is the use of the ratio of a firm's performance to the performance of the industry in which it operates. However, the reason for using the difference instead of the ratio is that the denominator of the ratio might be negative and if that is the case, it will distort the value of performance. For example, if a firm has a ROA of 12% and an industry average ROA of -2%, then its industry-adjusted ratio is -6. On the other hand, if another firm in the same industry has a ROA of -12%, its industry-adjusted ratio is +6. A value of +6 should be superior to -6. However, it is not so because the negative value of the denominator has distorted the comparison.

The average performance of the industry for a firm was computed by summing up all products of multiplying the average performance of each industry by the proportion of the firm's operations in that industry (Michel & Hambrick, 1992). The equation is shown in the following.

$$PERF_i = \sum_j p_{ij} \ PERF_{ij} \tag{5.1}$$

where $PERF_i$ is the industry-adjusted performance of firm i, $PERF_{ij}$ is the average performance of industry j, and p_{ij} is the proportion of the operation of firm i in industry j.

In the study of Michel and Hambrick (1992), the average performance of an industry was extracted from the Internal Revenue Service's (IRS) Statistic of Income -- Corporate Income Tax Returns. However, the most recent data from IRS's reports available for this study was the year 1988. This could not satisfy the need of this study because it required data up to the year of 1990 for the computation of the lagging three-year performance for the year 1988. Therefore, in this study, the average performance of an industry was computed by averaging the performance of all firms listed under the same two-digit SIC codes in COMPUSTAT industrial file. The high correlations between the data from IRS's reports and COMPUSTAT along all financial performance measures for the year 1984, shown in Table 5.4, indicated that the industry average performance based on COMPUSTAT could be used to replace the average based on IRS's reports.

Table 5.4 Correlations between Aggregate Performance Measures from IRS Reports and COMPUSTAT

ROA	.7240***
ROS	.9232***
SG	.3189***
SdROA	.4030***
SdROS	.5380***

*** $p < .01$

Changes in Global Diversification and firm performance:

Changes in global diversification and firm performance were measured by the differences in the degree of global diversification (i.e., in terms of three global diversification components) and performance respectively between the years 1984 and 1988. The general equation for this computation is shown below.

$$\Delta M = M_{88} - M_{84} \tag{5.2}$$

where ΔM is the change between the measurement in 1988 (M_{88}) and that in 1984 (M_{84}).

Control variable:

As noted earlier, some variables must be controlled in examining the relationship between global diversification and firm performance. Besides the industry effect which was already controlled for in the performance measures, firm size was the other variable controlled for in this study.

Firm size was measured by the natural logarithm of assets (e.g., Miller & Pras, 1980; Mirchandani & Lee, 1991). The use of natural log of assets can satisfy the assumption of normality in regression analysis because the size of the firms included in the sample skews to the larger side. Although sales revenue has been used to measure firm size in global diversification research (e.g., Grant, 1987), total assets provide a better measure of firm size than sales because assets are less prone to annual fluctuations and are not biased by differences in the labor intensity of technologies (Miller & Pras, 1980).

Methods of Analysis

For testing hypotheses of the relationship between global diversification and firm performance, multiple hierarchical regression was used. For example, to the test of Hypothesis 1c using 1984 data, sales growth (SG) was the dependent variable and the components of global diversification (GLN, GUD, and GRD) were the main independent variables. The first step was to enter the control variable (i.e., the firm size), the second step was to enter all three components of global diversification (i.e., GLN, GUD and GRD), the third step was to enter the three two-way interaction terms between the components of global diversification (i.e., GLNxGUD, GLNxGRD and GUDxGRD), and the last step was to enter the three-way interaction term (i.e., GLNxGUDxGRD). The same procedure was repeated to test each hypothesis. Where necessary the input variables were modified. For example, ΔGLN was used to measure the dynamic nature of globalization and GLN was used to measure its cross-sectional nature.

The assumptions of multiple regression were closely examined for each analysis. These assumptions mainly include: homoscedasticity, independence of the error term, and normality of the error term distribution (Berenson, Levine, & Goldstein, 1983; Fox, 1991). Also, the possibility of multicollinearity was investigated in order to avoid misinterpretations of results.

In general, multicollinearity can be detected by correlation analysis and inspection of regression results. Violations of homoscedasticity and normality of the error term distribution can be detected by analysis of residuals. Independence of the error term can be investigated by means of Durbin-Watson d-statistic. Multicollinearity and violations of assumptions should be fixed before interpretations of results.

Moreover, the statistical power of each significant regression analysis was examined in order to ensure the reliability of the results (Cohen, 1988).

The comparisons of the GODI and Kim's global diversification measure and Palepu's diversification measure were conducted via a series of hierarchical regressions. Sometimes referred to as "usefulness analysis," these tests compare the residual variances of the dependent variable explained by each measure after controlling for the variance explained by the other measure (Darlington, 1968). This approach has been used in management research for examining a predictor's contribution to unique variance explained beyond the contribution of another predictor (e.g., Folger & Konovsky, 1989). In this study, one of two measures to be compared was entered into the hierarchical regression with the control variable in the first step. Then, the other measure was entered. The same procedure was repeated by entering the other measure first. The changes in R^2 in both regression equations were used to compare the relative importance of the two measures in the prediction of the dependent variable. GODI was compared with Kim's global diversification measure and Palepu's diversification measure by analyzing the data for the years 1984 and 1988 as well as the change between these two years.

CHAPTER 6 RESULTS

Sixty-six hierarchical regression analyses were conducted and all significant regressions had a statistical power over 0.80 (Cohen, 1988). The assumptions of multiple regression, i.e., homoscedasticity, independence of the error term, and normality of the error term distribution (Berenson et al., 1983; Fox, 1991), and the possibility of multicollinearity were examined for each regression analysis. Violations of these requirements were tackled before interpretations of the results.

For every hierarchical regression analysis, a significant increment in R^2 after entering all global diversification components was interpreted as support for a significant impact from global diversification components on the corresponding firm performance measure. Similarly, a significant increment in R^2 after entering the interactions of global diversification components was interpreted as support for a significant impact from those interactions on the corresponding firm performance measure.

For all significant interactions, global diversification components were dichotomized into two levels, i.e., high (H) and low (L), by the medians and cross-tabulated, after the regressions were completed, to help interpret the results. For example, H-GLN means a high level of globalization. The mean of each cell was computed according to the firm performance measure used for the concerned analysis. Although dichotomization and cross-tabulation of the data may not fully explain the interactive relationships identified by regression analyses, they do provide insightful clues to interpret such relationships.

Handling of Outliers

Outliers were found in most regression analyses of this study. In general, outliers can create great difficulty in least-squared regression analysis because they may pull the fitted line disproportionately toward them and may cause problems with the assumption of normality of the error term distribution (Fox, 1991; Neter, Wasserman, & Kutner, 1989). On the other hand, outliers may imply that some important information or variables are missing in the study (Fox, 1991; Neter et al., 1989).

Two approaches are commonly used to handling outliers: transform or discard. Researchers have proposed many different transformation techniques to resolve the problem of the violation of normality due to outliers (e.g., Barnett & Lewis, 1984; Chatterjee & Wiseman, 1985). On the other hand, researchers never rule out the possibility of discarding outliers. But most researchers suggest that outliers should not be discarded without justification (Fox, 1991; Pindyck & Rubinfeld, 1981).

In this study, the plots of standardized residuals of most regression analyses showed that the error terms were not normally distributed. An example of the plots of standardized residuals is shown in Figure 6.1. Figure 6.1 shows that the shape of the error term distribution looked symmetric but the center was outpeaked and some cases (outliers) were well separated from the majority of the data. The outpeaked center made the distribution non-normal. Such a violation of normality was attributed to outliers.

The symmetrically outpeaked distribution of error terms also suggested that most available transformation techniques might not lead to normality. For example, log (or natural log) transformation is appropriate for skewed distributions and square-root transformation is

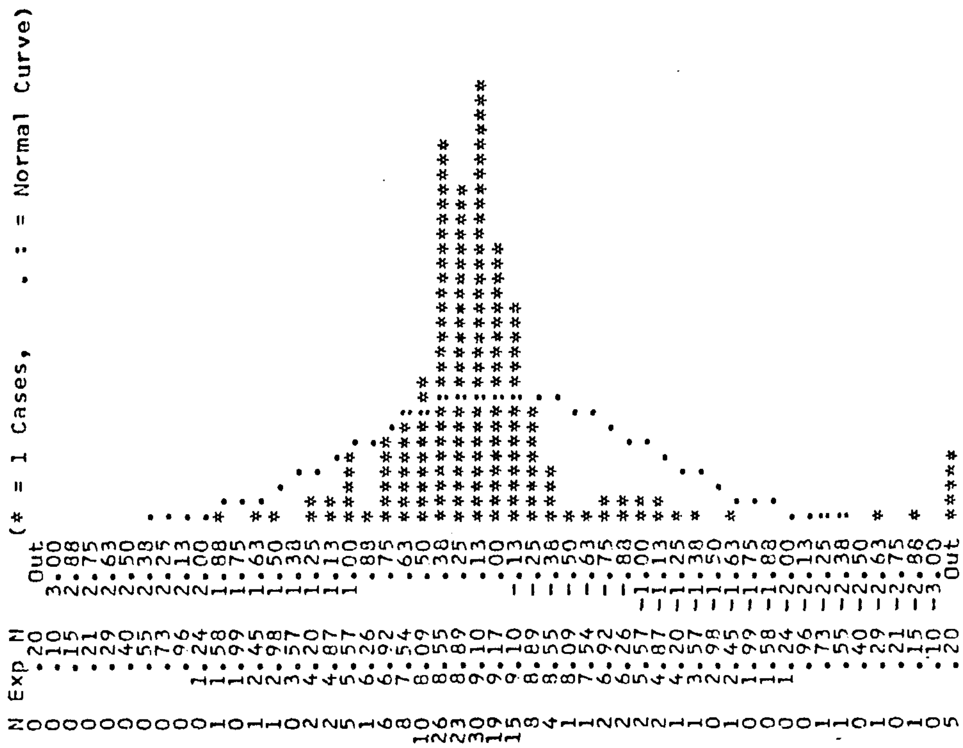


Figure 6.1 An Example of the Error Term Distribution in Regression Analysis

appropriate for flat and evenly widespread distributions. Neither works well for outpeaked distributions.

Another consideration is that the dependent variables of this study were measures of firm performance with ranges beyond the control of researchers. Firms may have extremely good or poor performance because of extraordinary events which are unknown to outsiders. These events are often unique to the firms affected and may not cause a systematic influence on the data in general. Further investigation into these events or outlying cases was not allowed in this study because of time constraints. Therefore, outliers were discarded in order to provide a clearer picture of the general trend in the relationship between global diversification and firm performance.

Outliers were identified by standardized residuals (in z-scores). The limit was the absolute value of 2.5 which represents a probability of about 1% with respect to either normal distribution or t-distribution. That means, cases with an absolute standardized residual greater than 2.5 were considered as outliers and discarded in regression analysis.

Regarding the report of results, it is suggested that the results of both the full sample and the sample without outliers should be provided if outliers are discarded

(Pindyck & Rubinfeld, 1981). In this chapter, the regression results of both the full sample and the sample without outliers are reported. Only the results for the sample without outliers will be interpreted in detail.

Cross-Sectional Analyses of the Relationships between Global Diversification and Firm Performance

1984 Data:

The 1984 data contained information on 174 firms. Table 6.1 shows the summary statistics of all concerned variables in this section. All significant correlations between global diversification components and performance measures were in the same directions hypothesized in Hypotheses 1a to 1d. Also, some significant correlations between global diversification components were found (e.g., GLN and GRD). But they were not extremely large and there were no symptoms of multicollinearity, such as reversals of expected signs and extremely large standard errors of regression coefficients (Berenson et al., 1983), in the regression analyses conducted later.

Tables 6.2 to 6.7 provide the results of hierarchical regression analyses for the six dependent variables

Table 6.1 Summary Statistics of the 1984 Data

	Mean (S.D.)	SIZE	GLN	GUD
SIZE	5.37(1.60)	1.00[1]		
GLN	.37(.42)	.36***	1.00	
GUD	.89(.50)	.20***	-.09	1.00
GRD	.57(.39)	.29***	-.31***	-.18**
ROA	.21(7.87)	.17**	.10	.04
ROS	2.54(7.89)	.12	.22***	.08
SdROA	1.82(4.86)	-.23***	-.06	-.23***
SdROS	-1.47(5.05)	-.14*	-.17**	-.33***
SG	5.36(29.40)	-.02	-.09	-.03
PR	-.75(32.84)	.01	.02	.03

	GRD	ROA	ROS	SdROA
GRD	1.00			
ROA	-.02	1.00		
ROS	-.13	.87***	1.00	
SdROA	-.02	-.71***	-.57***	1.00
SdROS	.12	-.58***	-.69***	.75***
SG	.03	.18**	.17**	-.17**
PR	-.06	.12	.14*	-.14*

	SdROS	SG	PR
SdROS	1.00		
SG	-.16**	1.00	
PR	-.09	.25***	1.00

1: Correlation coefficient

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.2 Hierarchical Regression Results of Control Variable (Step 1), Global Diversification Strategies (Step 2), and Interaction Terms (Steps 3 and 4) on Firm Performance (1984 ROA)

	Beta (Full sample)	Beta (Without outliers)
Control:		
SIZE	.1737	.1054
ΔR^2	.0302	.0111
Strategies:		
GLN	.0060	.0285
GUD	-.0134	-.0535
GRD	-.0763	-.0890
ΔR^2	.0054	.0110
2-way interactions:		
GLNxGUD	-.5727	-.2714
GLNxGRD	-.3904	-.2837
GUDxGRD	.1404	.3763
ΔR^2	.0193	.0140
3-way interaction:		
GLNxGUDxGRD	.3388	.8361
ΔR^2	.0002	.0013
Total R^2	.0551	.0375
N	174	169
No. of outliers	5	
Avg $\lvert z \rvert$ of outliers	3.7855	

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.3 Hierarchical Regression Results of Control Variable (Step 1), Global Diversification Strategies (Step 2), and Interaction Terms (Steps 3 and 4) on Firm Performance (1984 ROS)

	Beta (Full sample)	Beta (Without outliers)
Control:		
SIZE	.1236	.1319*
ΔR^2	.0153	.0174*
Strategies:		
GLN	.1683*	.1742*
GUD	.0596	.0419
GRD	-.0922	-.1566
ΔR^2	.0483**	.0737***
2-way interactions:		
GLNxGUD	-.1811	.2215
GLNxGRD	-.2891	-.3579
GUDxGRD	.3458	.4461
ΔR^2	.0110	.0151
3-way interaction:		
GLNxGUDxGRD	-.0260	.3519
ΔR^2	.0000	.0002
Total ΔR^2	.0746	.1065**
N	174	170
No. of outliers	4	
Avg $\lvert z \rvert$ of outliers	4.3243	

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.4 Hierarchical Regression Results of Control Variable (Step 1), Global Diversification Strategies (Step 2), and Interaction Terms (Steps 3 and 4) on Firm Performance (1984 SdROA)

	Beta (Full sample)	Beta (Without outliers)
Control:		
SIZE	-.2257***	-.2271***
ΔR^2	.0509***	.0516***
Strategies:		
GLN	-.0097	-.0095
GUD	-.1941**	-.2229***
GRD	-.0104	-.0364
ΔR^2	.0346*	.0445**
2-way interactions:		
GLNxGUD	.6733	.7616*
GLNxGRD	.4310	.8463**
GUDxGRD	.4363	.3893
ΔR^2	.0224	.0444**
3-way interaction:		
GLNxGUDxGRD	.0215	-.4641
ΔR^2	.0000	.0004
Total R^2	.1079**	.1409***
N	174	171
No. of outliers	3	
Avg $\lvert z \rvert$ of outliers	5.5547	

* p < .10
** p < .05
*** p < .01

Table 6.5 Hierarchical Regression Results of Control Variable (Step 1), Global Diversification Strategies (Step 2), and Interaction Terms (Steps 3 and 4) on Firm Performance (1984 SdROS)

	Beta (Full sample)	Beta (Without outliers)
Control:		
SIZE	-.1442*	-.1947**
ΔR^2	.0208*	.0379**
Strategies:		
GLN	-.2043**	-.1995**
GUD	-.3518***	-.4074***
GRD	-.0074	-.0108
ΔR^2	.1307***	.1640***
2-way interactions:		
GLNxGUD	.1802	.0654
GLNxGRD	.2260	.4459
GUDxGRD	.2824	.3964
ΔR^2	.0046	.0123
3-way interaction:		
GLNxGUDxGRD	1.1510	1.4308
ΔR^2	.0024	.0037
Total R^2	.1585***	.2179***
N	174	171
No. of outliers	3	
Avg $\lvert z \rvert$ of outliers	4.4765	

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.6 Hierarchical Regression Results of Control Variable (Step 1), Global Diversification Strategies (Step 2), and Interaction Terms (Steps 3 and 4) on Firm Performance (1984 SG)

	Beta (Full sample)	Beta (Without outliers)
Control:		
SIZE	-.0186	.1060
ΔR^2	.0003	.0112
Strategies:		
GLN	-.1193	-.1652*
GUD	-.0499	-.0899
GRD	-.0238	-.2465**
ΔR^2	.0106	.0382*
2-way interactions:		
GLNxGUD	-.0074	-.3560
GLNxGRD	-.3149	-.0625
GUDxGRD	.1842	.4350
ΔR^2	.0060	.0147
3-way interaction:		
GLNxGUDxGRD	-.1488	-1.3434
ΔR^2	.0000	.0033
Total R^2	.0170	.0674
N	174	171
No. of outliers	3	
Avg $\lvert z \rvert$ of outliers	6.0709	

* p < .10
** p < .05
*** p < .01

Table 6.7 Hierarchical Regression Results of Control Variable (Step 1), Global Diversification Strategies (Step 2), and Interaction Terms (Steps 3 and 4) on Firm Performance (1984 PR)

	Beta (Full sample)	Beta (Without outliers)
Control:		
SIZE	.0077	.1037
ΔR^2	.0001	.0108
Strategies:		
GLN	-.0078	.0704
GUD	.0110	.0534
GRD	-.0630	.0712
ΔR^2	.0038	.0045
2-way interactions:		
GLNxGUD	.2960	.1563
GLNxGRD	.0320	-.2303
GUDxGRD	.5284	.8106**
ΔR^2	.0110	.0288
3-way interaction:		
GLNxGUDxGRD	.5957	1.1797
ΔR^2	.0007	.0026
Total R^2	.0155	.0467
N	174	165
No. of outliers	3	
Cases without data	6	
Avg $\lvert z \rvert$ of outliers	4.8600	

* p < .10
** p < .05
*** p < .01

discussed in Chapter 5: ROA, ROS, ROA stability, ROS stability, sales growth, and stock price ratio.

Concerning the examination of assumptions of regression, no violations of homoscedasticity and independence of the error term were found. Some outliers were discarded in order to maintain normality of the error term distribution.

Full sample. The regression analysis of the full sample shows that firm size had only a significant negative impact ($p < 0.01$) on SdROA and a weak negative impact ($p < 0.10$) on SdROS. After controlling for the size effect, globalization (GLN) had a weak positive impact ($p < 0.10$) on ROS and a significant negative impact ($p < 0.05$) on SdROS. Global unrelated diversification (GUD) had a significant negative impact on SdROA ($p < 0.05$) as well as on SdROS ($p < 0.01$). Global related diversification (GRD) had no impact on any measure of firm performance. Moreover, no interactive effects from global diversification components were found.

Sample without outliers. After discarding outliers, the regression results were different from that found in the full sample. The results show that firm size had a significant impact ($p < 0.05$) only on SdROA and SdROS, not on all measures of performance. After controlling for the size effect, globalization (GLN) had a weak positive impact ($p < 0.10$) on ROS, a significant negative impact ($p < 0.05$) on SdROS and a weak negative impact ($p < 0.10$) on sales growth; global unrelated diversification (GUD) had a significant negative impact ($p < 0.01$) on both SdROA and SdROS; global related diversification (GRD) had a significant negative impact ($p < 0.05$) on sales growth.

The results of the sample without outliers indicate that diversification into more geographic regions helps increase ROS and reduce its variability over time (lower SdROS). Furthermore, diversification into unrelated industries in different geographic regions appears to increase the stability of both ROA and ROS.

On the other hand, the negative relationship between globalization (GLN) and sales growth contradicts the hypothesis that global diversification is positively related to sales growth. However, it is possible that less globalized firms perform better in sales growth because they are more focused on domestic markets. By contrast, more globalized firms tend to be more focused on global markets and probably neglect domestic markets which may result in relatively lower sales growth than less globalized firms.

Interestingly, global related diversification (GRD) was also negatively related to sales growth. This indicates that firms that diversify more into related businesses may have relatively lower sales growth because of the restricted size of the market they target.

The interaction of globalization and global unrelated diversification (GLNxGUD) had a weak positive impact ($p < 0.10$) on SdROA. Likewise, the interaction of globalization and global related diversification (GLNxGRD) had a significant positive impact ($p < 0.05$) on SdROA.

The cross-tabulation of globalization (GLN) vs global unrelated diversification (GUD) in Figure 6.2 shows that both globalization and global unrelated diversification had a stabilizing effect on ROA. That means increase in either globalization (GLN) or global unrelated diversification (GUD) can reduce SdROA (or increase the stability of ROA). But based on the intervals of reduction, global unrelated diversification (GUD) appeared more effective in doing so than globalization (GLN); global unrelated diversification was especially useful for stabilizing ROA when the level of globalization was low. The firms with relatively higher levels of globalization and global unrelated diversification exhibited the lowest value of SdROA. By contrast, the firms in cell with the lowest globalization and global unrelated diversification (L-GLN, L-GUD) experienced the greatest variability in ROA over the time period examined. This indicates that firms with more of their overseas assets diversified into

		GLN low	GLN high
GUD	high	1 0.9411 (50)	3 0.7626 (37)
	low	2 2.1472 (37)	4 1.4905 (47)

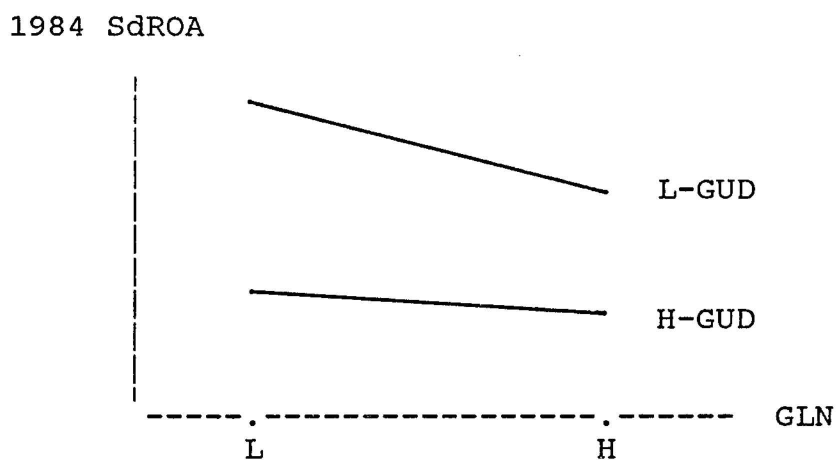


Figure 6.2 Means (with Group Sizes in Parentheses) of 1984 SdROA of Interaction Groups -- 1984 GLNxGUD

unrelated industries enjoy a higher level of stability in ROA. This supports the notion that both geographic dispersion and unrelated diversification have an effect on the stability of profitability.

The cross-tabulation of globalization (GLN) vs global related diversification (GRD) in Figure 6.3 shows that increasing globalization could reduce SdROA only when the level of global related diversification was low. At high global related diversification, high globalization brought forth a high value in SdROA. The firms with relatively higher levels of globalization and global related diversification (H-GLN, H-GRD) had less stability in ROA than the firms with low globalization and high global related diversification (L-GLN, H-GRD). In other words, the more geographic regions a firm was involved in and the more related a firm's operations in each region were, the lower the stability of its ROA. This indicates that the instability of profitability from operations in related industries cannot be diversified away through involvement in different geographic regions. The influence of operation relatedness seems to overwhelm globalization in dealing with the stability of profitability.

		GLN low	GLN high
GRD	high	1 1.4102 (52)	3 1.7854 (34)
	low	2 1.5191 (35)	4 0.7513 (50)

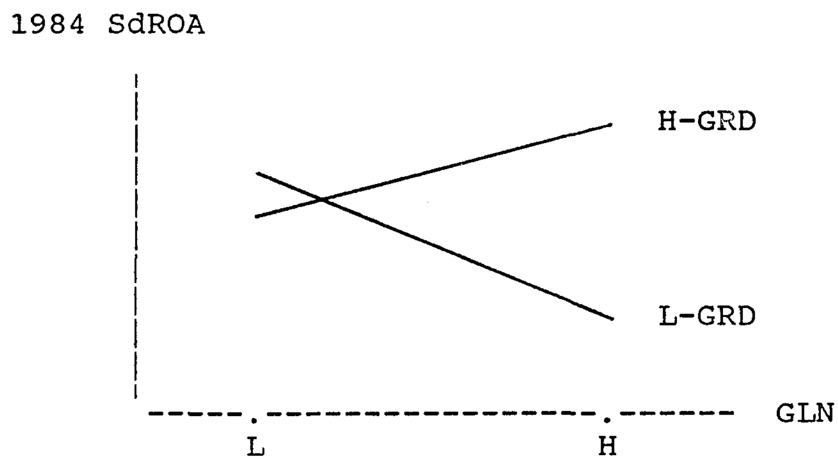


Figure 6.3 Means (with Group Sizes in Parentheses) of 1984 SdROA of interaction groups-- 1984 GLNxGRD

1988 Data:

The 1988 data contained information on 189 firms. The summary statistics of the concerned variables and the regression results are shown in Table 6.8 and Tables 6.9 to 6.14, respectively. All significant correlations between global diversification components and performance measures were in the same directions hypothesized in Hypotheses 1a to 1d. Also, some significant correlations between global diversification components were found (e.g., GLN and GUD). But they were not extremely large and there were no symptoms of multicollinearity, such as reversals of expected signs or extremely large standard errors of regression coefficients (Berenson et al., 1983), in the regression analyses conducted later.

Concerning the examination of assumptions of regression, no violations of homoscedasticity and independence of the error term were found. Outliers were discarded in order to maintain normality of the error term distribution. The results of both full sample and the sample without outliers are reported in Table 6.9 through Table 6.14.

Full sample. The regression analysis of the full sample shows that, after controlling for the size effect, globalization (GLN) had a weak positive impact ($p < 0.10$)

Table 6.8 Summary Statistics of the 1988 Data

	Mean (S.D.)	SIZE	GLN	GUD
SIZE	5.69(1.74)	1.00[1]		
GLN	.44(.47)	.39***	1.00	
GUD	.92(.47)	.18**	-.16**	1.00
GRD	.52(.36)	.38***	-.12	-.15**
ROA	1.18(8.55)	.24***	.16**	.01
ROS	18.73(42.07)	.14*	.18**	.15**
SdROA	1.77(4.77)	-.25***	-.12	-.12
SdROS	-14.11(40.27)	-.13*	-.16**	-.17**
SG	2.13(20.80)	.04	.03	-.05
PR	-4.54(21.68)	-.04	.07	-.07

	GRD	ROA	ROS	SdROA
GRD	1.00			
ROA	.07	1.00		
ROS	-.10	.19***	1.00	
SdROA	-.09	-.82***	-.07	1.00
SdROS	.10	-.10	-.99***	.03
SG	-.01	.25***	.01	-.26***
PR	.01	.36***	.00	-.29***

	SdROS	SG	PR
SdROS	1.00		
SG	-.00	1.00	
PR	.02	.16**	1.00

1: Correlation coefficient

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.9 Hierarchical Regression Results of Control Variable (Step 1), Global Diversification Strategies (Step 2), and Interaction Terms (Steps 3 and 4) on Firm Performance (1988 ROA)

	Beta (Full sample)	Beta (Without outliers)
Control:		
SIZE	.2339***	.1942***
ΔR^2	.0547***	.0377***
Strategies:		
GLN	.0719	.1311
GUD	-.0179	-.0100
GRD	.0004	.0167
ΔR^2	.0053	.0145
2-way interactions:		
GLNxGUD	-.5073	-.3304
GLNxGRD	.2056	.5431
GUDxGRD	-.2262	.3595
ΔR^2	.0131	.0225
3-way interaction:		
GLNxGUDxGRD	-.6106	-2.0152
ΔR^2	.0006	.0063
Total R^2	.0737*	.0810*
N	189	184
No. of outliers	5	
Avg $\lvert z \rvert$ of outliers	4.0180	

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.10 Hierarchical Regression Results of Control Variable (Step 1), Global Diversification Strategies (Step 2), and Interaction Terms (Steps 3 and 4) on Firm Performance (1988 ROS)

	Beta (Full sample)	Beta (Without outliers)
Control:		
SIZE	.1373*	.1218
ΔR^2	.0189*	.0148
Strategies:		
GLN	.1592*	.2380***
GUD	.1469*	.1931**
GRD	-.0855	.0169
ΔR^2	.0506**	.0598**
2-way interactions:		
GLNxGUD	.7121*	.9218**
GLNxGRD	.3359	.2428
GUDxGRD	-.1683	-.1520
ΔR^2	.0223	.0336*
3-way interaction:		
GLNxGUDxGRD	.9917	-4.7742***
ΔR^2	.0015	.0350***
Total R^2	.0932**	.1432***
N	189	182
No. of outliers	7	
Avg $\lvert z \rvert$ of outliers	4.1649	

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.11 Hierarchical Regression Results of Control Variable (Step 1), Global Diversification Strategies (Step 2), and Interaction Terms (Steps 3 and 4) on Firm Performance (1988 SdROA)

	Beta (Full sample)	Beta (Without outliers)
Control:		
SIZE	-.2543***	-.2670***
ΔR^2	.0647***	.0713***
Strategies:		
GLN	-.0611	-.0348
GUD	-.0959	-.1171
GRD	-.0402	-.0423
ΔR^2	.0077	.0109
2-way interactions:		
GLNxGUD	.6574	.3641
GLNxGRD	.0399	-.4507
GUDxGRD	.4549	-.3563
ΔR^2	.0195	.0198
3-way interaction:		
GLNxGUDxGRD	-1.3009	-.0706
ΔR^2	.0026	.0000
Total R^2	.0945**	.1020**
N	189	184
No. of outliers	5	
Avg $\lvert z \rvert$ of outliers	4.4053	

* p < .10
** p < .05
*** p < .01

Table 6.12 Hierarchical Regression Results of Control Variable (Step 1), Global Diversification Strategies (Step 2), and Interaction Terms (Steps 3 and 4) on Firm Performance (1988 SdROS)

	Beta (Full sample)	Beta (Without outliers)
Control:		
SIZE	-.1329*	-.1176
ΔR^2	.0177*	.0138
Strategies:		
GLN	-.1449*	-.2130**
GUD	-.1683**	-.2441***
GRD	.0825	-.0248
ΔR^2	.0523**	.0673***
2-way interactions:		
GLNxGUD	-.8001	-1.1348***
GLNxGRD	-.2701	-.0946
GUDxGRD	.1983	.2205
ΔR^2	.0269	.0523**
3-way interaction:		
GLNxGUDxGRD	-1.2675	4.4096**
ΔR^2	.0025	.0299**
Total R^2	.0992**	.1632***
N	189	182
No. of outliers	7	
Avg $\|z\|$ of outliers	4.2071	

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.13 Hierarchical Regression Results of Control Variable (Step 1), Global Diversification Strategies (Step 2), and Interaction Terms (Steps 3 and 4) on Firm Performance (1988 SG)

	Beta (Full sample)	Beta (Without outliers)
Control:		
SIZE	.0353	.1435*
ΔR^2	.0013	.0206*
Strategies:		
GLN	-.0147	-.0405
GUD	-.0691	-.1102
GRD	-.0469	-.0742
ΔR^2	.0044	.0106
2-way interactions:		
GLNxGUD	-.1389	.1137
GLNxGRD	.4394	-.2432
GUDxGRD	-.3981	-.1586
ΔR^2	.0127	.0039
3-way interaction:		
GLNxGUDxGRD	.6904	3.2429*
ΔR^2	.0007	.0160*
Total R^2	.0191	.0511
N	189	185
No. of outliers	4	
Avg $\lvert z \rvert$ of outliers	5.0891	

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.14 Hierarchical Regression Results of Control Variable (Step 1), Global Diversification Strategies (Step 2), and Interaction Terms (Steps 3 and 4) on Firm Performance (1988 PR)

	Beta (Full sample)	Beta (Without outliers)
Control:		
SIZE	-.0437	.0358
ΔR^2	.0019	.0013
Strategies:		
GLN	.1106	.0525
GUD	-.0265	-.0208
GRD	.0613	.0018
ΔR^2	.0128	.0032
2-way interactions:		
GLNxGUD	.1439	.1431
GLNxGRD	.1588	.0833
GUDxGRD	.0821	.0259
ΔR^2	.0015	.0009
3-way interaction:		
GLNxGUDxGRD	-2.4113	-2.4404
ΔR^2	.0091	.0093
Total R^2	.0253	.0147
N	189	182
No. of outliers	2	
Cases without data	5	
Avg $\lvert z \rvert$ of outliers	4.6309	

* $p < .10$
** $p < .05$
*** $p < .01$

on ROS and a weak negative impact ($p < 0.10$) on SdROS. Global unrelated diversification (GUD) had a weak positive impact ($p < 0.10$) on ROS and a significant negative impact ($p < 0.05$) on SdROS. Global related diversification (GRD) had no impact on any performance measure. Moreover, global diversification components had no interactive effects on any performance measures.

Sample without outliers. After discarding outliers and controlling for the size effect, globalization (GLN) had a weak positive impact ($p < 0.10$) on ROS and a weak negative impact ($p < 0.10$) on SdROS; its relationship with other performance measures was insignificant. Global unrelated diversification (GUD) had a weak positive impact ($p < 0.10$) on ROS and a significant negative impact ($p < 0.05$) on SdROS, but no impact on any other performance measure. No impact was found from global related diversification (GRD) on any measure of firm performance.

This indicates that diversification into more geographic regions helps increase ROS and reduce SdROS (or increase the stability of ROS). Diversification into unrelated industries in different geographic regions also can increase the stability of ROS.

The interaction of globalization (GLN) and global unrelated diversification (GUD) had a significant impact on ROS ($p < 0.05$) and SdROS ($p < 0.01$). The three-way interaction of globalization (GLN), global unrelated diversification (GUD) and global related diversification (GRD) had an impact on ROS ($p < 0.01$), SdROS ($p < 0.05$) and SG ($p < 0.10$). Only the three-way interaction was examined because it included all two-way interactions.

Figure 6.4 shows that both globalization (GLN) and global unrelated diversification (GUD) could raise ROS. Firms that were high in globalization and global unrelated diversification (H-GLN, H-GUD) were better than others in terms of ROS. Global related diversification did the opposite. Firms that were higher in global related diversification performed more poorly than those that were lower in global related diversification, except for firms that were highly globalized (H-GLN). This indicates that related diversification is not as profitable as shown in the literature (e.g., Rumelt, 1974). It is possible that keen competition among related diversifiers pulled their ROS down. However, globally related diversifiers (H-GLN, L-GUD, H-GRD) perform better than globalized undiversifiers (H-GLN, L-GUD, L-GRD) in terms of ROS because the former can pursue a greater number of market opportunities through globalization.

Figure 6.5 shows that both globalization (GLN) and global unrelated diversification (GUD) could reduce SdROS (or increase the stability of ROS). But global related

1988 GLN = low

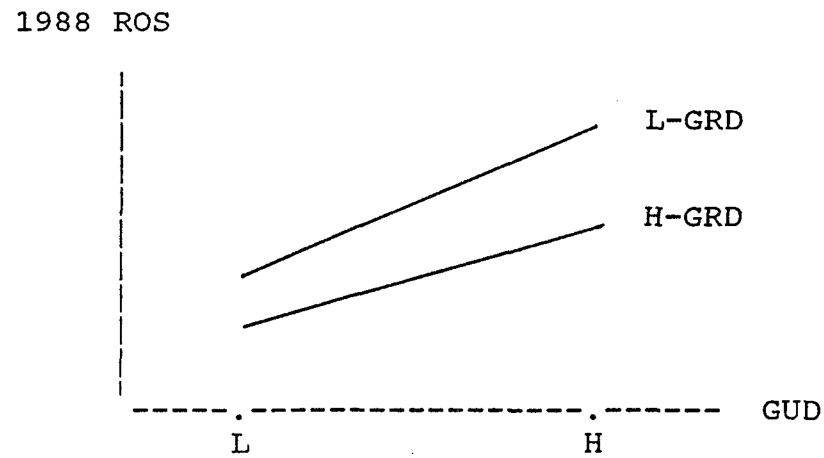
		GUD low	GUD high
GRD	high	1 7.1115 (29)	3 9.2346 (21)
GRD	low	2 8.3746 (12)	4 11.7310 (31)

1988 GLN = high

		GUD low	GUD high
GRD	high	5 11.9871 (25)	7 18.2943 (20)
GRD	low	6 9.9972 (27)	8 19.6172 (17)

Figure 6.4 Means (with Group Sizes in Parentheses) of 1988 ROS of Interaction Groups -- 1988 GLNxGUDxGRD

1988 GLN = low



1988 GLN = high

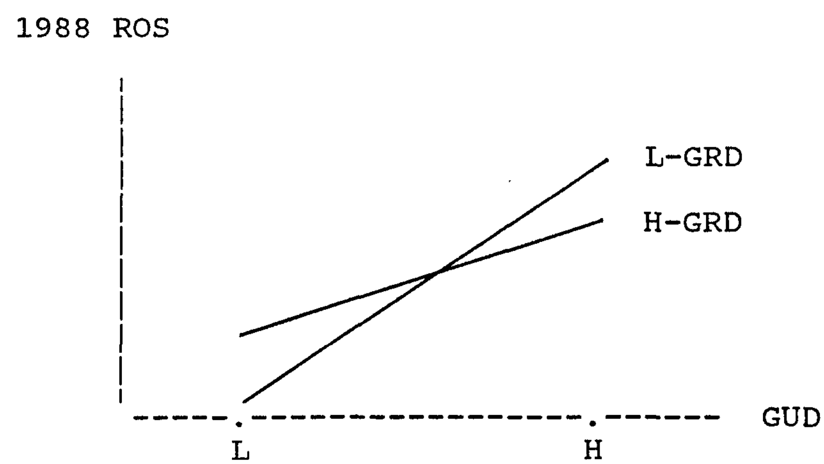


Figure 6.4 (cont.)

1988 GLN = low

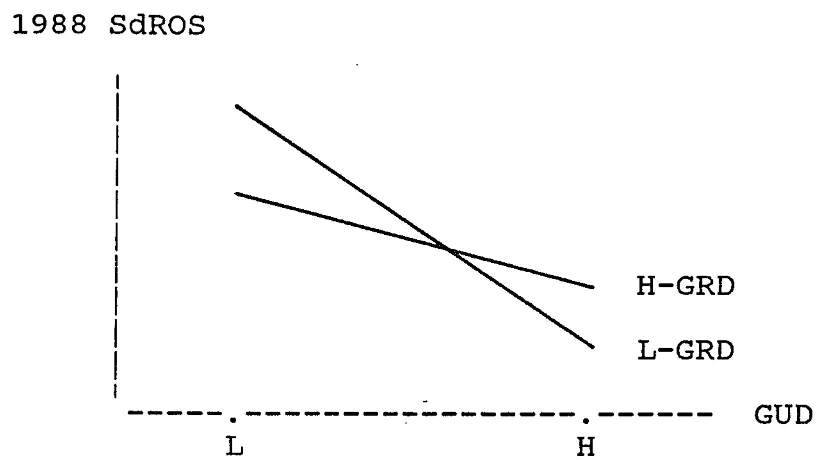
GRD		GUD low	GUD high
GRD	high	1 -4.2333 (29)	3 -6.6719 (21)
	low	2 -2.8058 (12)	4 -7.9673 (31)

1988 GLN = high

GRD		GUD low	GUD high
GRD	high	5 -4.6200 (25)	7 -14.0220 (20)
	low	6 -4.9209 (27)	8 -15.5005 (17)

Figure 6.5 Means (with Group Sizes in Parentheses) of 1988 SdROS of Interaction Groups -- 1988 GLNxGUDxGRD

1988 GLN = low



1988 GLN = high

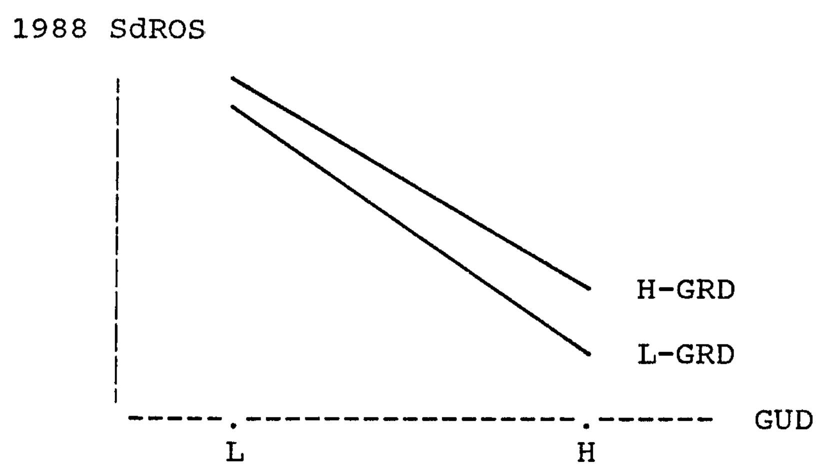


Figure 6.5 (cont.)

diversification had an opposite effect, except when both globalization and global unrelated diversification were low. This indicates that firms that were high in both globalization and global unrelated diversification (H-GLN, H-GUD) had greater stability in ROS than others. Firms that were higher in global related diversification (H-GRD) generally had lower stability in ROS because they are too concentrated in related industries. The economic fluctuation in the industry may cause the instability of ROS among related diversifiers. An exception is that domestic related diversifiers (L-GLN, L-GUD, H-GRD) had better ROS stability than domestic undiversifiers (L-GLN, L-GUD, L-GRD) because the latter is even more concentrated than the former in scope of operations. The more concentrated the scope of operation is, the lower stability in ROS.

No definite pattern concerning the relationship between global diversification and sales growth can be identified from Figure 6.6. Firms that were less diversified ([L-GLN, L-GUD, L-GRD] or [H-GLN, L-GUD, L-GRD]) had the best scores in sales growth. This indicates that specialized firms may have higher sales growth than diversified firms because the former is more focused on fewer markets and perhaps serves the clients better than the latter. On the other hand, firms that diversified in

1988 GLN = low

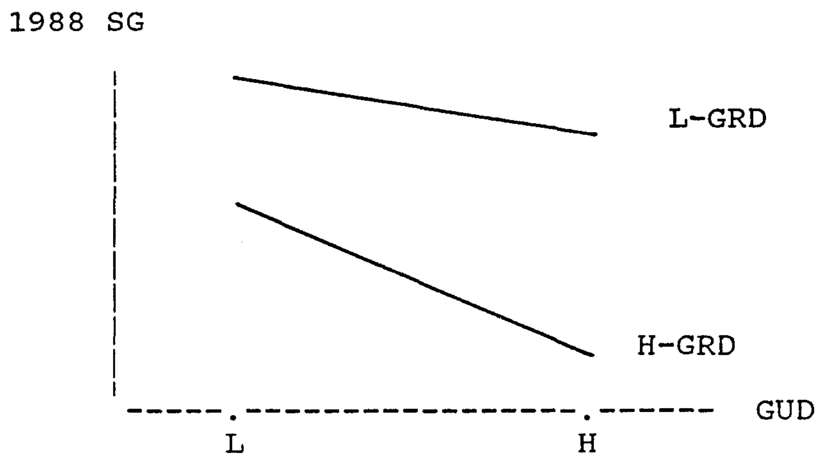
GRD \ GUD	low	high
high	1 -0.3321 (29)	3 -7.4039 (21)
low	2 2.2761 (11)	4 1.4586 (31)

1988 GLN = high

GRD \ GUD	low	high
high	5 -0.4036 (24)	7 1.9593 (21)
low	6 2.3619 (28)	8 -2.2777 (20)

Figure 6.6 Means (with Group Sizes in Parentheses) of 1988 SG of Interaction Groups -- 1988 GLNxGUDxGRD

1988 GLN = low



1988 GLN = high

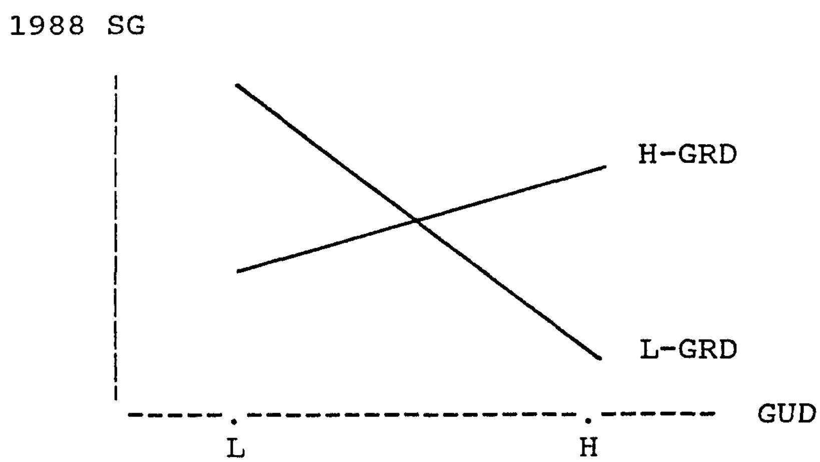


Figure 6.6 (cont.)

both unrelated and related industries domestically (L-GLN, H-GUD, H-GRD) had the poorest sales growth. This indicates that domestic firms that diversify without a specific direction may not grow as fast as those which choose a more specific diversification strategy (either related or unrelated but not both).

Summary of cross-sectional analyses:

The results of the sample without outliers show more significant relationships between global diversification and firm performance than that of the full sample. This indicates that outliers were influential in the above analyses.

However, the cross-sectional analyses of both 1984 and 1988 data, with or without outliers, consistently showed that components of global diversification had a positive impact on ROS and its stability, but no impact on other performance measures. This indicates that Hypothesis 1a is weakly supported, Hypothesis 1b is supported, and Hypotheses 1c and 1d are rejected.

On the other hand, the results indicate the interaction of global diversification components did not have any consistent influence on performance measures. Therefore, Hypotheses 2a to 2d are rejected.

Dynamic Impact of Global Diversification on Firm Performance

The dynamic impact of global diversification on firm performance was analyzed by investigating the impact of the change in global diversification between 1984 and 1988 on the change in firm performance during the same period.

A sample of 152 firms with data for both years was used for this analysis. Table 6.15 shows the summary statistics of the concerned variables in this section and Tables 6.16 to 6.21 provide the results of hierarchical regression analyses for each performance measure. All significant correlations between the changes in global diversification components and the changes in performance measures were in the same directions hypothesized in Hypotheses 3a to 3d. Also, the correlation between ΔGUD and ΔGRD was significant. But it was not extremely large and there were no symptoms of multicollinearity, such as reversals of expected signs or extremely large standard errors of regression coefficients (Berenson et al., 1983), in the regression analyses conducted later.

Concerning the examination of assumptions of regression, no violations of homoscedasticity and independence of the error term were found. Outliers were

Table 6.15 Summary Statistics of the Data on the Changes between 1984 and 1988

	Mean (S.D.)	ΔSIZE	ΔGLN	ΔGUD
ΔSIZE	.57(1.07)	1.00[1]		
ΔGLN	.07(.16)	.15*	1.00	
ΔGUD	.03(.36)	.10	.03	1.00
ΔGRD	-.03(.31)	.09	-.01	-.36***
ΔROA	.31(9.42)	.36***	.15*	.16*
ΔROS	15.54(40.24)	.02	.06	.02
ΔSdROA	.07(6.83)	-.41***	-.17**	-.27***
ΔSdROS	-12.52(39.03)	-.01	-.05	-.03
ΔSG	-3.47(28.45)	.10	.03	.08
ΔPR	-2.23(28.65)	-.23***	-.06	-.02

	ΔGRD	ΔROA	ΔROS	ΔSdROA
ΔGRD	1.00			
ΔROA	.05	1.00		
ΔROS	.09	.20**	1.00	
ΔSdROA	-.04	-.84***	-.11	1.00
ΔSdROS	-.08	-.12	-.99***	.08
ΔSG	-.04	.20**	.08	-.23***
ΔPR	-.02	.22***	.13	-.16***

	ΔSdROS	ΔSG	ΔPR
ΔSdROS	1.00		
ΔSG	-.09	1.00	
ΔPR	-.12	.19**	1.00

1: Correlation coefficient

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.16 Hierarchical Regression Results of Control Variable (Step 1), Global Diversification Strategies (Step 2), and Interaction Terms (Steps 3 and 4) on Improvement in Firm Performance (ΔROA during 1984-88)

	Beta (Full sample)	Beta (Without outliers)
Control:		
ΔSIZE	.3546***	.4293***
ΔR^2	.1258***	.1843***
Strategies:		
ΔGLN	.1032	.2567***
ΔGUD	.1467*	.0355
ΔGRD	.0678	-.0384
ΔR^2	.0291	.0702***
2-way interactions:		
ΔGLNxΔGUD	1.3736	2.9685***
ΔGLNxΔGRD	.5590	.3168
ΔGUDxΔGRD	-.7584	.3973
ΔR^2	.0346	.0713***
3-way interaction:		
ΔGLNxΔGUDxΔGRD	-1.4575	-9.6786*
ΔR^2	.0004	.0178*
Total R^2	.1898***	.3435***
N	152	146
No. of outliers	6	
Avg $\lvert z \rvert$ of outliers	3.3764	

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.17 Hierarchical Regression Results of Control Variable (Step 1), Global Diversification Strategies (Step 2), and Interaction Terms (Steps 3 and 4) on Improvement in Firm Performance (ΔROS during 1984-88)

	Beta (Full sample)	Beta (Without outliers)
Control:		
ΔSIZE	.0218	.1076
ΔR^2	.0005	.0116
Strategies:		
ΔGLN	.0547	.1744**
ΔGUD	.0584	-.0845
ΔGRD	.1162	-.0056
ΔR^2	.0144	.0356
2-way interactions:		
ΔGLNxΔGUD	-.0307	1.1491
ΔGLNxΔGRD	-1.0093	-.2298
ΔGUDxΔGRD	.6609	.0498
ΔR^2	.0166	.0132
3-way interaction:		
ΔGLNxΔGUDxΔGRD	-7.3632	-13.8283**
ΔR^2	.0098	.0348**
Total R^2	.0413	.0951*
N	152	146
No. of outliers	6	
Avg |z| of outliers	4.1102	

* p < .10
** p < .05
*** p < .01

Table 6.18 Hierarchical Regression Results of Control Variable (Step 1), Global Diversification Strategies (Step 2), and Interaction Terms (Steps 3 and 4) on Improvement in Firm Performance (ΔSdROA during 1984-88)

	Beta (Full sample)	Beta (Without outliers)
Control:		
ΔSIZE	-.4086***	-.1806**
ΔR^2	.1669***	.0326**
Strategies:		
ΔGLN	-.1099	-.1595
ΔGUD	-.2671***	-.1409
ΔGRD	-.1030	.0161
ΔR^2	.0730***	.0465*
2-way interactions:		
ΔGLNxΔGUD	-1.8189**	.1444
ΔGLNxΔGRD	-.2488	-.2345
ΔGUDxΔGRD	.8172**	-.0281
ΔR^2	.0532**	.0007
3-way interaction:		
ΔGLNxΔGUDxΔGRD	1.4414	1.0975
ΔR^2	.0004	.0002
Total R^2	.2935***	.0801
N	152	147
No. of outliers	5	
Avg $\lvert z \rvert$ of outliers	3.9841	

* p < .10
** p < .05
*** p < .01

Table 6.19 Hierarchical Regression Results of Control Variable (Step 1), Global Diversification Strategies (Step 2), and Interaction Terms (Steps 3 and 4) on Improvement in Firm Performance (ΔSdROS during 1984-88)

	Beta (Full sample)	Beta (Without outliers)
Control:		
ΔSIZE	-.0100	-.1264
ΔR^2	.0001	.0160
Strategies:		
ΔGLN	-.0454	-.1356
ΔGUD	-.0725	-.0886
ΔGRD	-.1116	-.0896
ΔR^2	.0134	.0279
2-way interactions:		
ΔGLNxΔGUD	.1733	-1.4560
ΔGLNxΔGRD	1.0443	-1.0349
ΔGUDxΔGRD	-.7044	.2740
ΔR^2	.0184	.0169
3-way interaction:		
ΔGLNxΔGUDxΔGRD	5.6614	14.5801**
ΔR^2	.0058	.0391**
Total R^2	.0377	.0999*
N	152	144
No. of outliers	8	
Avg $\lvert z \rvert$ of outliers	4.1590	

* p < .10
** p < .05
*** p < .01

Table 6.20 Hierarchical Regression Results of Control Variable (Step 1), Global Diversification Strategies (Step 2), and Interaction Terms (Steps 3 and 4) on Improvement in Firm Performance (ΔSG during 1984-88)

	Beta (Full sample)	Beta (Without outliers)
Control:		
ΔSIZE	.0982	.3036***
ΔR^2	.0097	.0922***
Strategies:		
ΔGLN	.0093	.0899
ΔGUD	.0545	-.0801
ΔGRD	-.0320	-.1826**
ΔR^2	.0054	.0381*
2-way interactions:		
ΔGLNxΔGUD	.4582	2.4025**
ΔGLNxΔGRD	3.7572***	3.7497***
ΔGUDxΔGRD	-1.2807***	-.4197
ΔR^2	.0986***	.0681***
3-way interaction:		
ΔGLNxΔGUDxΔGRD	-7.5494	-1.2801
ΔR^2	.0103	.0003
Total R^2	.1239**	.1986***
N	152	147
No. of outliers	5	
Avg |z| of outliers	3.7878	

* p < .10
** p < .05
*** p < .01

Table 6.21 Hierarchical Regression Results of Control Variable (Step 1), Global Diversification Strategies (Step 2), and Interaction Terms (Steps 3 and 4) on Improvement in Firm Performance (ΔPR during 1984-88)

	Beta (Full sample)	Beta (Without outliers)
Control:		
ΔSIZE	-.2294***	-.2121**
ΔR^2	.0526***	.0450**
Strategies:		
ΔGLN	-.0568	-.0568
ΔGUD	-.0238	.0275
ΔGRD	-.0116	-.0027
ΔR^2	.0037	.0041
2-way interactions:		
ΔGLNxΔGUD	.4035	.1837
ΔGLNxΔGRD	.7481	.7523
ΔGUDxΔGRD	-.4819	-.3162
ΔR^2	.0098	.0051
3-way interaction:		
ΔGLNxΔGUDxΔGRD	-2.9267	-3.7422
ΔR^2	.0016	.0027
Total R^2	.0677	.0569
N	152	139
No. of outliers	5	
Cases without data	8	
Avg $\|z\|$ of outliers	3.0615	

* $p < .10$
** $p < .05$
*** $p < .01$

discarded in order to maintain normality of the error term distribution.

Full sample. The analysis of the full sample shows that the change in firm size influenced only ΔROA, ΔSdROA and ΔPR. After controlling for the size effect, the change in global unrelated diversification (ΔGUD) had a significant negative impact ($p < .01$) on ΔSdROA. The interaction of the change in globalization and the change in global unrelated diversification (ΔGLNxΔGUD) had a significant negative impact ($p < 0.05$) on ΔSdROA. The interaction of the change in globalization and the change in global related diversification (ΔGLNxΔGRD) had a significant positive impact ($p < 0.01$) on ΔSG. The interaction of the change in global unrelated diversification and global related diversification (ΔGUDxΔGRD) had a significant positive impact ($p < 0.05$) on ΔSdROA and a significant negative impact ($p < 0.01$) on ΔSG.

Sample without outliers. The results of the sample without outliers show that the change in firm size influenced ΔROA, ΔSdROA, ΔSG and ΔPR, but not ΔROS and ΔSdROS. After controlling for the size effect, the unique dynamic impact of global diversification on performance was examined.

The change in globalization (ΔGLN) had a significant positive impact ($p < 0.01$) on ΔROA and a significant negative impact ($p < 0.05$) on ΔSdROA; it had no impact on the changes in other performance measures. The change in the extent of global unrelated diversification (ΔGUD) had no significant effect on any performance measure. The change in global related diversification (ΔGRD) had little impact on performance excepting for a significant negative impact ($p < 0.05$) on ΔSG.

In contrast to previous findings (Geringer et al., 1989; Simmonds et al., 1991), the interactions of the changes in global diversification components had a significant impact on the change in profitability. In fact, significant interactive effects occurred in all hierarchical regression analyses, except those using the change in SdROA (ΔSdROA) and the change in stock price ratio (ΔPR) as dependent variables. The inconsistency may be attributed to the nature of research design. The studies of Geringer et al. (1989) and Simmonds et al. (1991) are cross-sectional, not dynamic. The analysis in the following sections will mainly focus on the interactions found from the results of the sample without outliers because these interactions include all significant main effects and the sample without outliers can show the general trend of the majority of the data.

Impact on ΔROA:

As shown in Table 6.16, ΔGLNxΔGUD had a positive significant impact ($p < 0.01$) on ΔROA. The cross-tabulation is shown in Figure 6.7. At low ΔGLN, a decrease in ΔGUD increased ΔROA; in fact, the change in ROA went from negative to positive. At both levels of ΔGUD, greater ΔGLN improved ΔROA. The firms in the cells with H-ΔGLN were higher in ΔROA than those with L-ΔGLN. The firms with increasing levels of global unrelated diversification (H-ΔGUD) and relatively stable globalization (L-ΔGLN) had the lowest ΔROA. This implies that increasing in unrelated diversification may reduce ROA, but increasing in globalization may improve it.

ΔGLNxΔGUDxΔGRD had a weak negative impact ($p < 0.10$) on ΔROA. The cross-tabulation is shown in Figure 6.8. Cells with high ΔGLN were higher in ΔROA than their counterparts with low ΔGLN, except when ΔGUD and ΔGRD were both low. The firms that increased their globalization and global related diversification but not their global unrelated diversification and the firms that increased only their globalization and global unrelated diversification had the greatest increases in ROA. By contrast, firms that increased their diversification in

		ΔGLN low	ΔGLN high
ΔGUD	high	1 -1.1086 (32)	3 1.3376 (41)
	low	2 0.1446 (30)	4 1.4926 (43)

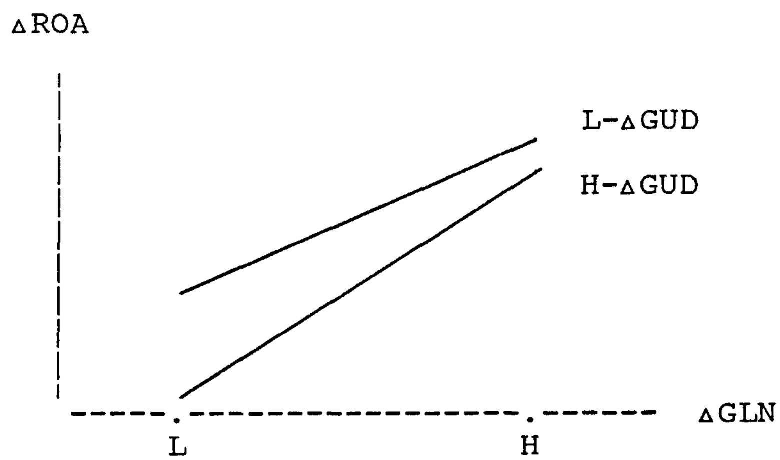


Figure 6.7 Means (with Group Sizes in Parentheses) of ΔROA of Interaction Groups -- ΔGLNxΔGUD

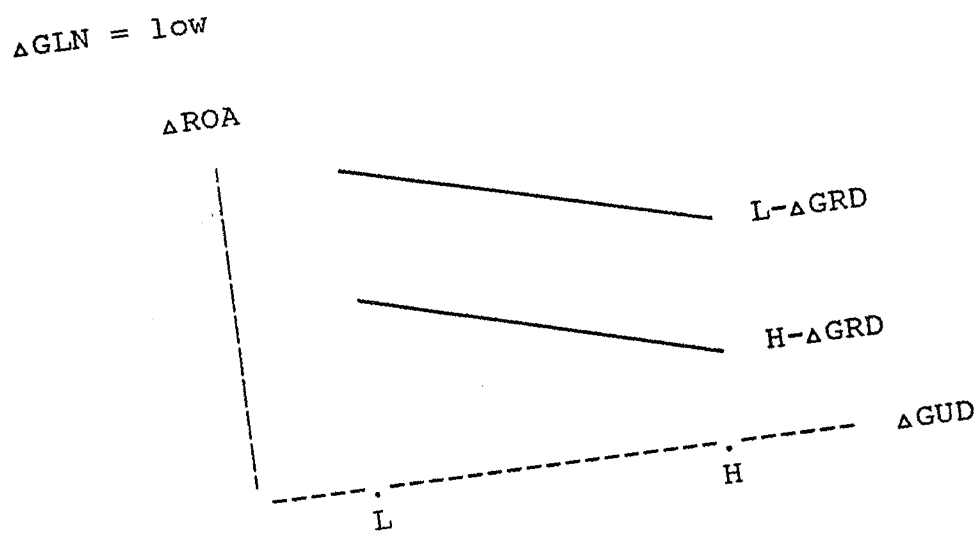
ΔGLN = low

ΔGRD \ ΔGUD	low	high
high	1 -0.3762 (21)	3 -2.8281 (12)
low	2 1.3597 (9)	4 -0.0769 (20)

ΔGLN = high

ΔGRD \ ΔGUD	low	high
high	5 1.9648 (29)	7 -0.0758 (11)
low	6 0.5144 (14)	8 1.8558 (30)

Figure 6.8 Means (with Group Sizes in Parentheses) of ΔROA of Interaction Groups -- ΔGLNxΔGUDxΔGRD



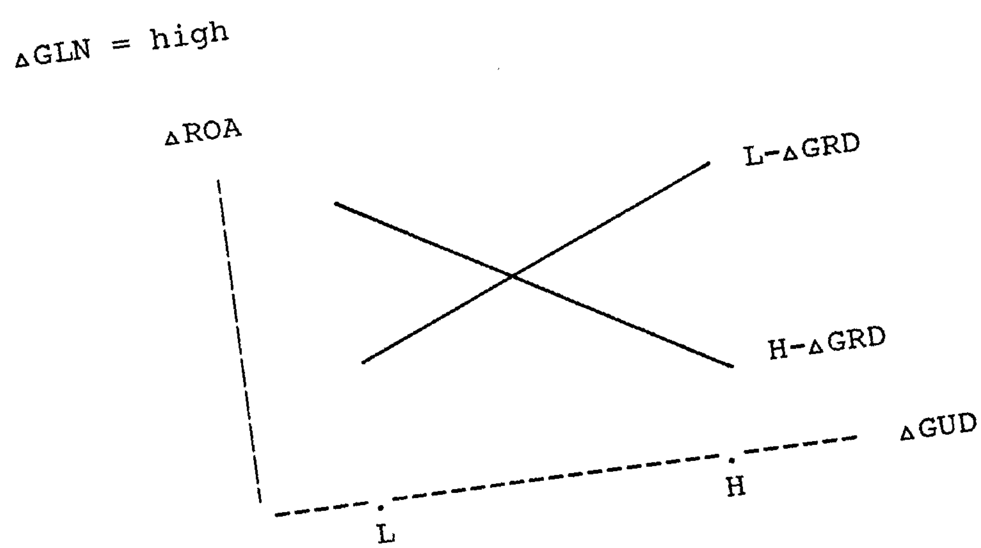


Figure 6.8 (cont.)

all three components (H-ΔGLN, H-ΔGUD, H-ΔGRD) experienced a negative change in ROA. This implies that increasing either GRD or GUD in concert with increasing globalization can improve ROA, but trying to do both has the opposite effect. Firms improve ROA through pursuing a single global diversification strategy, i.e., either related or unrelated.

On the other hand, firms retrenching from or maintaining the same level of global diversification (L-ΔGLN, L-ΔGUD, L-ΔGRD) also improved their ROA. This suggests that firms that maintain a constant level of diversification or those that retrench and refocus on their major domestic operations in order to improve the ROA by disposing unprofitable or inefficient overseas assets, may reap considerable benefits from doing so.

Impact on ΔROS:

From Table 6.17, ΔGLNxΔGUDxΔGRD had a significant negative impact ($p < 0.05$) on ΔROS. The cross-tabulation is shown in Figure 6.9. Increase in global unrelated diversification tended to reduce ROS no matter what the levels ΔGLN and ΔGRD were. The firms that retrenched, maintained, or made few changes in the level of global diversification (L-ΔGLN, L-ΔGUD, L-ΔGRD) improved their

ΔGLN = low

		ΔGUD low	ΔGUD high
ΔGRD	high	1 6.3774 (21)	3 1.9336 (11)
ΔGRD	low	2 17.8164 (10)	4 6.0116 (22)

ΔGLN = high

		ΔGUD low	ΔGUD high
ΔGRD	high	5 11.6275 (28)	7 6.5776 (10)
ΔGRD	low	6 9.5266 (14)	8 7.9151 (29)

Figure 6.9 Means (with Group Sizes in Parentheses) of ΔROS of Interaction Groups -- ΔGLNxΔGUDxΔGRD

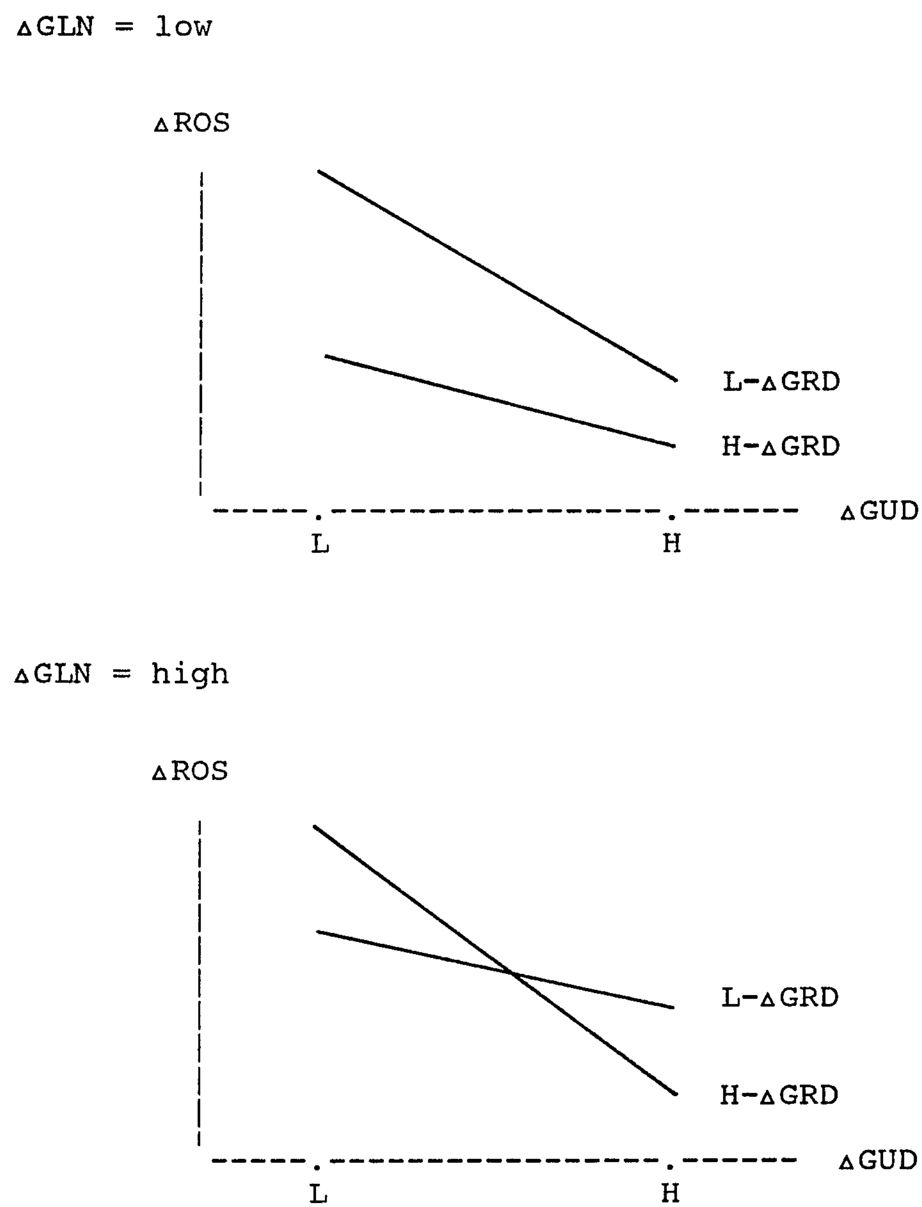


Figure 6.9 (cont.)

ROS the most. Firms that increased their globalization also experienced substantial gains in ROS. Thus, firms undergoing retrenchment, maintaining status quo, or pursuing globalization experienced greater improvements in ROS than those using other global diversification strategies. It appears that firms that want to maximize the improvement in their ROS must either make substantial increases in their global diversification or stand pat. Those firms that focus on diversification only in domestic markets do not do so well.

This implies that firms increasing diversification in both unrelated and related operations without a corresponding increase in their level of globalization forego the efficiency gains from expanding global operations or from the stability of no change at all.

Impact on ΔSdROA:

From Table 6.18, only ΔGLN had a significant negative impact ($p < 0.05$) on ΔSdROA. This indicates that an increase in globalization can improve a firm's stability in ROA.

<u>Impact on ΔSdROS</u>:

From Table 6.19, ΔGLNxΔGUDxΔGRD had a significant impact ($p < 0.05$) on ΔSdROS. The cross-tabulation is shown in Figure 6.10. Figure 6.10 shows that the effect of each variable was different depending on the combinations of the values of the other two variables. In general, firms with increasing globalization and either increasing global unrelated diversification (H-ΔGLN, H-ΔGUD, L-ΔGRD) or increasing global related diversification (H-ΔGLN, L-ΔGUD, H-ΔGRD), or both (H-ΔGLN, H-ΔGUD, H-ΔGRD), enjoyed improved stability in ROS. Nevertheless, firms exhibiting relatively stable or declining levels of globalization, global unrelated diversification, and global related diversification (L-ΔGLN, L-ΔGUD. L-ΔGRD) had the second greatest improvement in the variability in ROS overall.

This implies that improvement in ROS stability requires either strategic stability or aggressive globalization in concert with some form of product diversification. Again, strategies at either extreme seem to outperform those in the middle.

ΔGLN = low

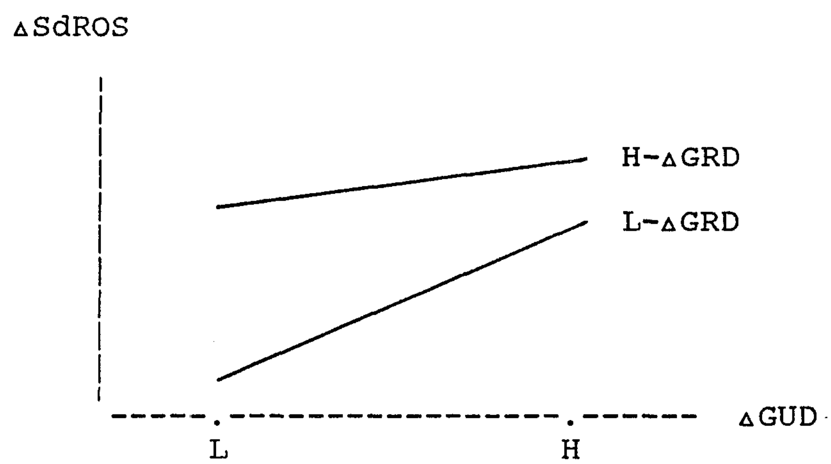
		ΔGUD low	ΔGUD high
ΔGRD	high	1 -3.4257 (21)	3 -1.0116 (11)
	low	2 -7.5767 (10)	4 -3.8976 (22)

ΔGLN = high

		ΔGUD low	ΔGUD high
ΔGRD	high	5 -7.5979 (28)	7 -3.4400 (10)
	low	6 0.2282 (13)	8 -5.3346 (29)

Figure 6.10 Means (with Group Sizes in Parentheses) of ΔSdROS of Interaction Groups -- ΔGLNxΔGUDxΔGRD

ΔGLN = low



ΔGLN = high

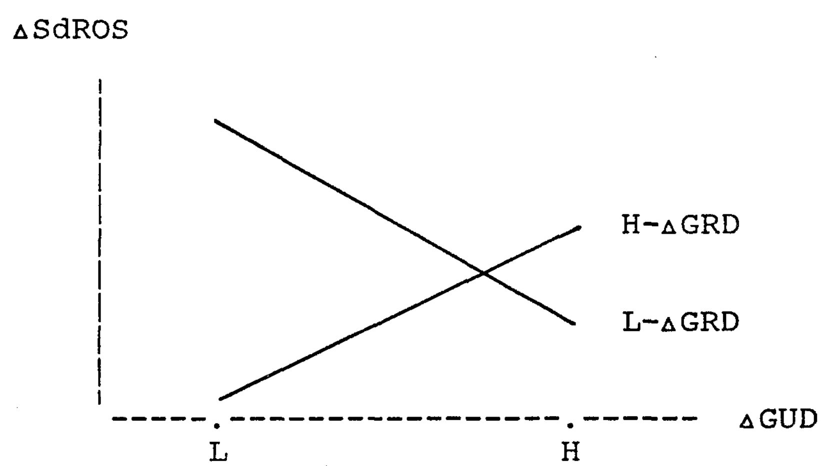


Figure 6.10 (cont.)

Impact on ΔSG:

From Table 6.20, ΔGLNxΔGUD and ΔGLNxΔGRD had a significant positive influence ($p < 0.01$) on ΔSG. Figure 6.11 shows that sales growth was positively influenced by more globalization and less unrelated diversification and negatively influenced by the opposite strategy. However, in the absolute, neither strategy appeared to lead to positive sales growth in general. Thus, firms with high ΔGLN and low ΔGUD had the smallest decrease in sales revenue. On the other hand, firms increasing their global unrelated diversification without increasing their globalization (L-ΔGLN, H-ΔGUD) had the largest decline in sales growth.

Figure 6.12 shows that the effect of ΔGLN depended on the level of ΔGRD (and vice versa). Low ΔGLN led to sales growth at low ΔGRD but led to major sales declines at high ΔGRD. On the average, only the firms that made the fewest changes in their level of globalization and global related diversification or retrenched (L-ΔGLN, L-ΔGRD) experienced positive sales growth. Interestingly, firms that increased both substantially (H-ΔGLN, H-ΔGRD) experienced relatively mild sales declines when compared to those that increased either their globalization or related diversification but not both. Again, for the firms in

		ΔGLN low	ΔGLN high
ΔGUD	high	1 −5.3236 (33)	3 −3.1031 (41)
ΔGUD	low	2 −2.2581 (29)	4 −0.9157 (43)

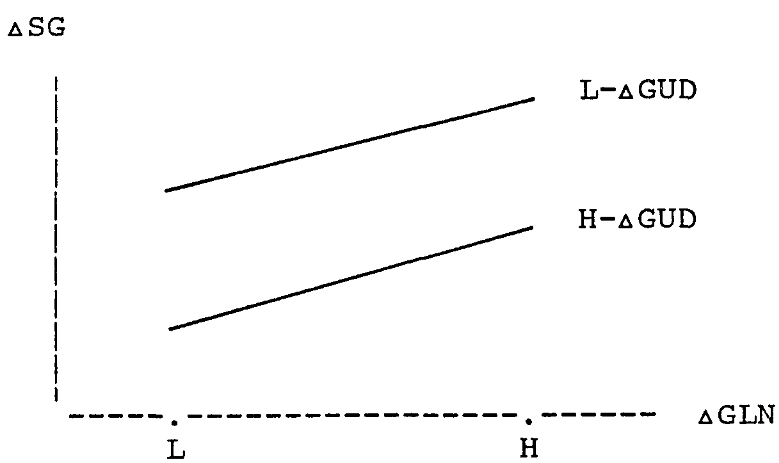


Figure 6.11 Means (with Group Sizes in Parentheses) of ΔSG of Interaction Groups -- ΔGLNxΔGUD

		ΔGLN low	ΔGLN high
ΔGRD	high	1 -8.9148 (33)	3 -0.5431 (40)
	low	2 1.6923 (30)	4 -3.2927 (44)

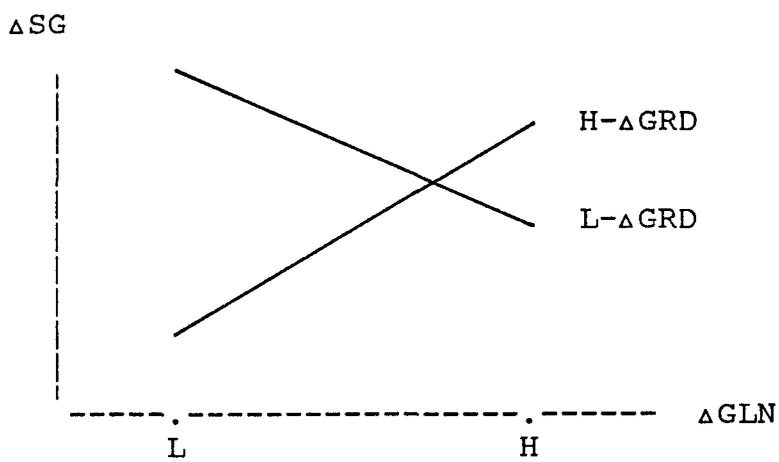


Figure 6.12 Means (with Group Sizes in Parentheses) of ΔSG of Interaction Groups -- ΔGLNxΔGRD

this sample, standing pat or retrenchment with respect to both globalization and global related diversification (L-ΔGLN, L-ΔGRD) appeared to be the best strategy. Aggressive expansion along both dimensions (H-ΔGLN, H-ΔGRD) appeared to be the next best alternative.

This implies that firms increasing in either unrelated or related diversification without increasing in GLN will have low ΔSG. Firms that neglect the global market have poorer ΔSG than others.

On the other hand, firms that outperformed others in ΔSG were either globalizing without increasing global unrelated diversification (H-ΔGLN, L-ΔGUD) or firms that did not increase either globalization or global related diversification (L-ΔGLN, L-ΔGRD). Globalizing firms that did not increase global unrelated diversification only globalized their assets; they did not further diversify into unrelated operations in those different geographic regions. Since both globalization and unrelated diversification involve an expanding customer base, the results suggest that such expansion should be done with caution. If sales growth is desired via customer expansion, globalization is preferable to unrelated diversification, perhaps because unrelated diversification also requires the management of products and skills that are unfamiliar.

Not increasing globalization and global related diversification (L-ΔGLN, L-ΔGRD) was another winning strategy in terms of ΔSG, in fact it was the only strategy that led to sales growth. Firms in this category maintained or retrenched their GRD strategy apparently concentrating on market expansion rather than market development (Ansoff, 1957). It could also be that firms maintaining their GRD strategy might have achieved superior coordination among their related operations and/or already achieved steady growth in sales making it unnecessary for them to change their original GRD strategy. Second, firms retrenching and refocusing assets on major operations may have benefitted from the concentration on a narrower range of product-market niches. Such a focus strategy might stimulate ΔSG.

Summary of dynamic analyses:

Similar to the cross-sectional analyses, the dynamic analyses of the sample without outliers display more significant relationships between strategy variables and firm performance than that of the full sample. This indicates that outliers were influential in the above analyses.

From the analysis of the full sample or the sample without outliers, it is clear that changes in global diversification components and their interactions had no impact on the change in stock price ratio (see Table 6.21).

From the results of the full sample, Hypotheses 3b and 4c are supported, Hypothesis 4b is partially supported, and Hypotheses 3a, 3c, 3d, 4a and 4d are rejected.

In the analysis of the sample without outliers, changes in global diversification components have a positive impact on changes in profitability and its stability, but a negative impact on the change in sales growth. This indicates that Hypotheses 3a and 3b are supported and Hypotheses 3c and 3d are rejected. The analysis of interactive effects shows that the relationship between the change in global diversification and the change in firm performance is complex. The dynamic effect of global diversification components on firm performance is better assessed interactively rather than independently because these components significantly interacted to influence four out of six performance measures used in this study. The results show that the global diversification components did not exhibit consistent moderating behavior across different performance measures. In summary, Hypotheses 4a and 4b are partially supported, Hypothesis 4c is supported, and Hypothesis 4d is rejected.

Global Diversification in the Triad Region and Performance of Firms in High-tech Industries

The relationship between the change in global diversification in the triad region and the change in firm performance during the period 1984-88 is the focus of this section. As in the dynamic analyses, the changes in performance measures were used as dependent variables. The changes in global diversification components in the triad region were taken as independent variables. Also, the interactions of the changes of these global diversification components were entered into the hierarchical regressions as in previous analyses. A sample of 82 firms from two high-tech industries (i.e., with an industry average of the ratio of research and development expenses to sales at least 3% for each year from 1982 to 1990) was used for this analysis. These two industries were electrical and electronic equipment (SIC 36) and instruments and related products (SIC 38). The summary statistics of the concerned variables and the results of hierarchical regression analyses are shown in Table 6.22 and Tables 6.23 to 6.28 respectively. All significant correlations between the changes in global diversification components in the triad region and the changes in performance measures were in the same directions hypothesized in Hypotheses 5a to 5d. Also, the correlation between ΔGUDtr and ΔGRDtr was significant. But it was not extremely large and there were no symptoms of multicollinearity, such as reversals of expected signs and extremely large standard errors of regression coefficients (Berenson et al., 1983).

Concerning the examination of assumptions of regression, no violations of homoscedasticity and independence of the error term were found. Outliers were discarded in order to maintain normality of the error term distribution. The number of outliers discarded in each analysis is shown in the respective table of regression results.

Full sample. The results of the full sample show that the change in firm size had an impact only on ΔROA, ΔSdROA, ΔSG and ΔPR. The change in globalization in the triad region (ΔGLNtr) had a significant positive impact ($p < 0.05$) on ΔSG. The change in global unrelated diversification in the triad region (ΔGUDtr) had a significant negative impact ($p < 0.01$) on ΔSdROA. But the

Table 6.22 Summary Statistics of the Data on the Changes in Global Diversification in the Triad Region between 1984 and 1988

	Mean (S.D.)	ΔSIZE	ΔGLNtr	ΔGUDtr
ΔSIZE	.53(1.03)	1.00[1]		
ΔGLNtr	.08(.14)	.28**	1.00	
ΔGUDtr	.03(.38)	.21*	-.07	1.00
ΔGRDtr	-.02(.36)	.12	.10	-.38***
ΔROA	.23(11.67)	.45***	.14	.22**
ΔROS	14.23(35.80)	.17	.04	.06
ΔSdROA	-.41(8.87)	-.56***	-.14	-.34***
ΔSdROS	-9.92(34.79)	-.15	-.03	-.09
ΔSG	1.72(25.09)	.41***	.25**	.22**
ΔPR	-1.18(27.11)	-.22*	-.05	-.14

	ΔGRDtr	ΔROA	ΔROS	ΔSdROA
ΔGRDtr	1.00			
ΔROA	.05	1.00		
ΔROS	.12	.23**	1.00	
ΔSdROA	-.06	-.89***	-.21*	1.00
ΔSdROS	-.10	-.12	-.98***	.16
ΔSG	-.13	.22**	.04	-.28**
ΔPR	-.06	.12	.06	-.07

	ΔSdROS	ΔSG	ΔPR
ΔSdROS	1.00		
ΔSG	-.08	1.00	
ΔPR	-.06	.20*	1.00

1: Correlation coefficient

* p < .10
** p < .05
*** p < .01

Table 6.23 Hierarchical Regression Results of Control Variable (Step 1), Triad-Region Diversification Strategies (Step 2), and Interaction Terms (Steps 3 and 4) on Improvement in Firm Performance (ΔROA during 1984-88) of Firms Operating in High-Tech Industries

	Beta (Full sample)	Beta (Without outliers)
Control:		
ΔSIZE	.4523***	.4898***
ΔR^2	.2046***	.2399***
Strategies:		
ΔGLNtr	.0263	.0350
ΔGUDtr	.1555	-.0129
ΔGRDtr	.0599	-.1262
ΔR^2	.0191	.0153
2-way interactions:		
ΔGLNtrxΔGUDtr	-.6741	.9961
ΔGLNtrxΔGRDtr	-2.1862	-.7564
ΔGUDtrxΔGRDtr	-.6893	.3484
ΔR^2	.0333	.0219
3-way interaction:		
ΔGLNtrxΔGUDtrxΔGRDtr	4.4373	-4.9768
ΔR^2	.0023	.0031
Total R^2	.2593***	.2802***
N	82	81
No. of outliers	1	
Avg $\lvert z \rvert$ of outliers	3.8952	

* p < .10
** p < .05
*** p < .01

Table 6.24 Hierarchical Regression Results of Control Variable (Step 1), Triad-Region Diversification Strategies (Step 2), and Interaction Terms (Steps 3 and 4) on Improvement in Firm Performance (ΔROS during 1984-88) of Firms Operating in High-Tech Industries

	Beta (Full sample)	Beta (Without outliers)
Control:		
ΔSIZE	.1732	.2831**
ΔR^2	.0300	.0801**
Strategies:		
ΔGLNtr	-.0124	.0206
ΔGUDtr	-.0741	-.0251
ΔGRDtr	.1285	.1163
ΔR^2	.0140	.0171
2-way interactions:		
ΔGLNtrxΔGUDtr	-.6345	1.2213
ΔGLNtrxΔGRDtr	-1.3892	-.3127
ΔGUDtrxΔGRDtr	.5917	.2036
ΔR^2	.0197	.0178
3-way interaction:		
ΔGLNtrxΔGUDtrxΔGRDtr	-1.5023	-4.3010
ΔR^2	.0003	.0021
Total R^2	.0640	.1172
N	82	81
No. of outliers	1	
Avg $\lvert z \rvert$ of outliers	5.1787	

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.25 Hierarchical Regression Results of Control Variable (Step 1), Triad-Region Diversification Strategies (Step 2), and Interaction Terms (Steps 3 and 4) on Improvement in Firm Performance (ΔSdROA during 1984-88) of Firms Operating in High-Tech Industries

	Beta (Full sample)	Beta (Without outliers)
Control:		
ΔSIZE	-.5636***	-.6693***
ΔR^2	.3177***	.4479***
Strategies:		
ΔGLNtr	-.0028	-.1123
ΔGUDtr	-.2764***	-.1184
ΔGRDtr	-.1089	.1307
2-way interactions:		
ΔGLNtrxΔGUDtr	-.4799	-2.6338**
ΔGLNtrxΔGRDtr	2.4134	.3165
ΔGUDtrxΔGRDtr	.6977	-.3176
3-way interaction:		
ΔGLNtrxΔGUDtrxΔGRDtr	-1.5227	2.3856
ΔR^2	.0003	.0007
Total R^2	.4302***	.5703***
N	82	81
No. of outliers	1	
Avg |z| of outliers	3.8786	

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.26 Hierarchical Regression Results of Control Variable (Step 1), Triad-Region Diversification Strategies (Step 2), and Interaction Terms (Steps 3 and 4) on Improvement in Firm Performance (ΔSdROS during 1984-88) of Firms Operating in High-Tech Industries

	Beta (Full sample)	Beta (Without outliers)
Control:		
ΔSIZE	-.1520	-.2544**
ΔR^2	.0231	.0647**
Strategies:		
ΔGLNtr	.0070	-.0352
ΔGUDtr	-.1167	-.0852
ΔGRDtr	-.1272	-.1240
ΔR^2	.0172	.0146
2-way interactions:		
ΔGLNtrxΔGUDtr	.2634	-2.4458*
ΔGLNtrxΔGRDtr	.9989	-.7890
ΔGUDtrxΔGRDtr	-.5959	-.2091
ΔR^2	.0175	.0424
3-way interaction:		
ΔGLNtrxΔGUDtrxΔGRDtr	1.1072	4.0119
ΔR^2	.0001	.0019
Total R^2	.0579	.1236
N	82	81
No. of outliers	1	
Avg |z| of outliers	5.2974	

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.27 Hierarchical Regression Results of Control Variable (Step 1), Triad-Region Diversification Strategies (Step 2), and Interaction Terms (Steps 3 and 4) on Improvement in Firm Performance (ΔSG during 1984-88) of Firms Operating in High-Tech Industries

	Beta (Full sample)
Control:	
ΔSIZE	.4285***
ΔR^2	.1836***
Strategies:	
ΔGLNtr	.2392**
ΔGUDtr	-.0085
ΔGRDtr	-.1293
ΔR^2	.0658*
2-way interactions:	
ΔGLNtrxΔGUDtr	2.4167**
ΔGLNtrxΔGRDtr	8.3312***
ΔGUDtrxΔGRDtr	-.4221
ΔR^2	.2322***
3-way interaction:	
ΔGLNtrxΔGUDtrxΔGRDtr	-3.9460
ΔR^2	.0018
Total R^2	.4833***
N	82
No. of outliers	0

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.28 Hierarchical Regression Results of Control Variable (Step 1), Triad-Region Diversification Strategies (Step 2), and Interaction Terms (Steps 3 and 4) on Improvement in Firm Performance (ΔPR during 1984-88) of Firms Operating in High-Tech Industries

	Beta (Full sample)	Beta (Without outliers)
Control:		
ΔSIZE	-.2199*	-.2197*
ΔR^2	.0483*	.0483*
Strategies:		
ΔGLNtr	-.0552	-.0555
ΔGUDtr	-.1878	-.1899
ΔGRDtr	-.1020	-.1031
ΔR^2	.0281	.0290
2-way interactions:		
ΔGLNtrxΔGUDtr	.2432	.2514
ΔGLNtrxΔGRDtr	.0755	.0743
ΔGUDtrxΔGRDtr	-.0921	-.0900
ΔR^2	.0477	.0483
3-way interaction:		
ΔGLNtrxΔGUDtrxΔGRDtr	-.0200	-.0175
ΔR^2	.0003	.0002
Total R^2	.1244	.1258
N	82	75
No. of outliers	1	
Cases without data	6	
Avg $\lvert z \rvert$ of outliers	3.5273	

* $p < .10$
** $p < .05$
*** $p < .01$

change in global related diversification in the triad region (ΔGRDtr) had no impact on any performance measure. Concerning the interactive effects, ΔGLNtrxΔGUDtr had a significant positive impact ($p < 0.05$) on ΔSG and ΔGLNtrxΔGRDtr also had a significant positive impact ($p < 0.01$) on ΔSG.

Sample without outliers. From the analysis of the sample without outliers, the change in firm size had an impact on ΔROA, ΔSdROA, ΔSG and ΔPR, not on ΔROS and ΔSdROS. It was controlled for in all regression analyses described in the following paragraphs.

ΔGLNtr had a significant impact ($p < 0.05$) on ΔSG, ΔGUDtr and ΔGRDtr had no main effects on any performance measure.

Three significant interaction effects were found. ΔGLNtrxΔGUDtr had a significant impact on ΔSdROA ($p < 0.05$) and ΔSG ($p < 0.05$), and ΔGLNtrxΔGRDtr had a significant impact ($p < 0.01$) on ΔSG. No other interactions were significant. The analysis in the following sections will mainly focus on the interactions found from the results of the sample without outliers because these interactions include all significant main effects and the sample without outliers can show the general trend of the majority of the data.

Impact on ΔSdROA:

As shown in Table 6.25, ΔGLNtrxΔGUDtr had a significant impact ($p < 0.01$) on ΔSdROA. Figure 6.13 shows that increases in both globalization and global unrelated diversification in the triad region (H-ΔGLNtr, H-ΔGUDtr) could reduce ΔSdROA. ΔGUDtr appeared to be more effective than ΔGLNtr in stabilizing ROA since the differences between low and high levels of ΔGUDtr were greater than between low and high levels of ΔGLNtr. This is consistent with the results in previous sections that both globalization and global unrelated diversification have a stability effect and that global unrelated diversification is more effective than globalization in this respect.

Impact on ΔSG:

From Table 6.27, ΔGLNtrxΔGUDtr and ΔGLNtrxΔGRDtr significantly influenced ΔSG at the 0.05 and 0.01 levels, respectively. Figure 6.14 shows that firms in the cells with H-ΔGLNtr had higher ΔSG than those with L-ΔGLNtr. Increases in globalization in the triad region raised ΔSG at both levels of ΔGUDtr, especially at L-ΔGUDtr. Interestingly, the level of change in unrelated

		ΔGLNtr low	ΔGLNtr high
ΔGUDtr	high	1 -0.7290 (24)	3 -3.5866 (16)
	low	2 0.5469 (16)	4 0.3583 (25)

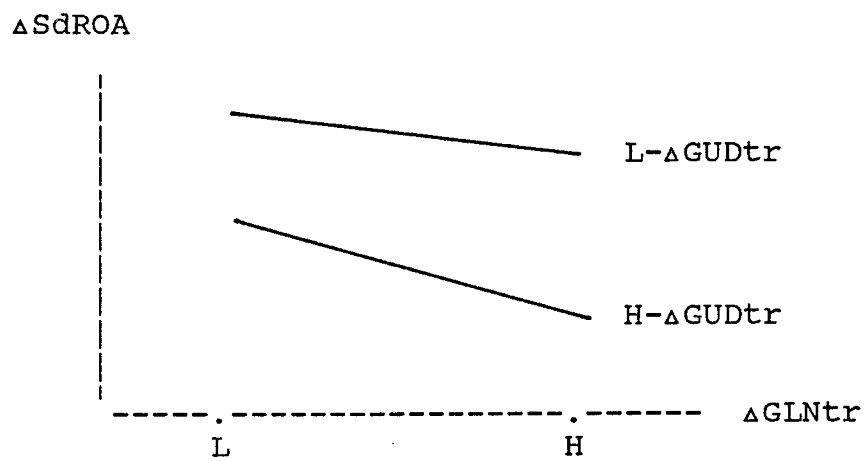


Figure 6.13 Means (with Group Sizes in Parentheses) of ΔSdROA of Interaction Groups -- ΔGLNtrxΔGUDtr

ΔGUDtr	ΔGLNtr low	ΔGLNtr high
high	1 -1.3998 (24)	3 4.1643 (16)
low	2 -7.1749 (17)	4 4.2717 (25)

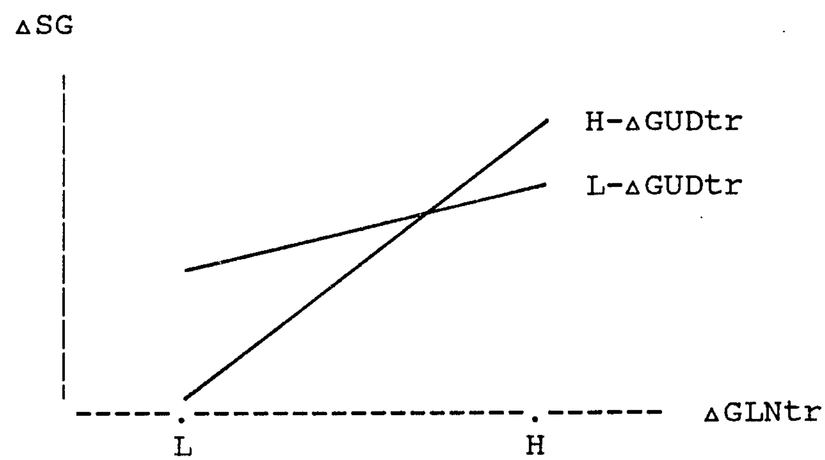


Figure 6.14 Means (with Group Sizes in Parentheses) of ΔSG of Interaction Groups -- ΔGLNtrxΔGUDtr

diversification mattered a lot when globalization in the triad region did not substantially increase (increasing GUDtr improved performance) but mattered little when globalization in the triad region was increased. The firms that had a stable or reduced level in both globalization and global unrelated diversification in the triad region (L-ΔGLNtr, L-ΔGUDtr) had the lowest ΔSG. The firms that increased their unrelated diversification without increasing their globalization in the triad region (L-ΔGLNtr, H-ΔGUDtr) had the second lowest ΔSG.

Figure 6.15 shows that the effect of ΔGLNtr was reversed between two different levels of ΔGRDtr. At L-ΔGRDtr, H-ΔGLNtr pulled ΔSG down a little, but the value of ΔSG was still positive. At H-ΔGRDtr, H-ΔGLNtr raised ΔSG substantially; in fact, changing the highly negative sales growth associated with low ΔGLNtr to highly positive. The firms that increased global related diversification in the triad region had the highest ΔSG. But the firms that increased related diversification without increasing globalization in the triad region had the lowest ΔSG.

The findings show that, in the main, firms increasing their involvement in the triad region, especially those that also increase global related diversification in the triad region, may expect the greatest ΔSG. This is

		ΔGLNtr low	ΔGLNtr high
ΔGRDtr	high	1 -11.0305 (17)	3 8.1166 (21)
	low	2 1.3312 (24)	4 0.1487 (20)

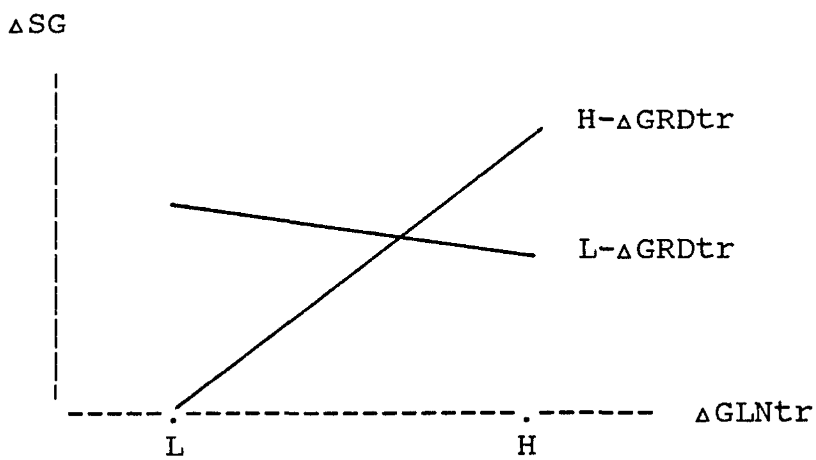


Figure 6.15 Means (with Group Sizes in Parentheses) of ΔSG of Interaction Groups -- ΔGLNtrxΔGRDtr

consistent with the hypothesis that firms in high-tech industries need to compete in the triad region to gain competitive advantages; presumably such advantages accrue through the sharing of technology and market development (Ohmae, 1985). Moreover, increasing levels of related diversification in the triad region may enable firms to further enhance their ability to capitalize on these potential advantages.

Summary of impact of diversification in the triad region:

The results using the full sample and the sample without outliers were slightly different with respect to the influence on ΔSdROA. The results of the full sample show that ΔGUDtr had an impact on ΔSdROA while the results of the sample without outliers show that ΔGLNtr and ΔGUDtr had an interactive impact on ΔSdROA.

The findings concerning ΔSG in this section were quite different from that discussed before. No outliers were found in the analysis of the relationship between the change in diversification in the triad region and ΔSG. The data of all firms show that, on average, increasing global related diversification could not improve ΔSG. But the data on firms in high-tech industries showed the opposite. This indicates that the effect of diversification in the triad region on the performance of firms operating in high-tech industries is not the same as in the effects of global diversification on firms in general.

The results of the full sample suggests that Hypotheses 5b, 5c and 6c are supported and Hypotheses 5a, 5d, 6a, 6b and 6d are rejected.

Using the sample without outliers, the results show that for firms in high-tech industries, ΔGLNtr had a positive impact on ΔSG. Also, positive interactive effects were found in both ΔSG and the change in the stability of ROA. There was no relationship between diversification in the triad region and other performance measures. Therefore, Hypotheses 5c, 6b, and 6c are supported while Hypotheses 5a, 5b, 5d, 6a, and 6d are rejected.

Global Diversification in Non-Triad Countries and Performance of Firms in Low-Tech Industries

The relationship between the change in global diversification in non-triad countries and the change in firm performance during the period 1984-88 is the focus of this section. A sample of 70 firms from five low-tech industries (i.e., with an industry average of the ratio of research and development expenses to sales below 3% for each year from 1982 to 1990) was used for this analysis. These five industries were textile mill products (SIC 22), apparel and other textile products (SIC 23), paper and allied products (SIC 26), rubber and miscellaneous plastic products (SIC 30), and fabricated metal products (SIC 34).

The summary statistics of the concerned variables in this section is shown in Table 6.29. All significant correlations found between the changes in global diversification components in non-triad countries and the changes in performance measures were in the same directions hypothesized in Hypotheses 7a to 7d. However, the changes in the three components of global diversification in non-triad countries were highly correlated with one another. Therefore, principal component factor analysis was used in order to reduce the effect of multicollinearity (Berenson et al., 1983). The result is shown in Table 6.30. Three factors were extracted but only one, with an eigen-value greater than 1 (i.e., 2.53, accountable for an explained variance over 84%), was used. The factor was named the change in global diversification in non-triad countries (ΔGDnt); the factor score was used in subsequent regression analyses.

Table 6.29 Summary Statistics of the Data on the Changes in Global Diversification in Non-Triad Regions between 1984 and 1988

	Mean (S.D.)	ΔSIZE	ΔGLNtr	ΔGUDnt
ΔSIZE	.63(1.12)	1.00[1]		
ΔGLNnt	-.00(.07)	.07	1.00	
ΔGUDnt	-.01(.05)	.11	.68***	1.00
ΔGRDnt	-.00(.05)	.10	.68***	.94***
ΔROA	.42(5.74)	.24**	.33***	.45***
ΔROS	17.12(45.24)	-.11	-.17	-.01
ΔSdROA	.65(2.86)	-.21*	-.54***	-.62***
ΔSdROS	-15.64(43.65)	.11	.19	.02
ΔSG	-9.71(31.07)	-.14	-.04	.10
ΔPR	-3.41(30.44)	-.24**	-.01	-.17

	ΔGRDnt	ΔROA	ΔROS	ΔSdROA
ΔGRDnt	1.00			
ΔROA	.51***	1.00		
ΔROS	.07	.22*	1.00	
ΔSdROA	-.68***	-.62***	.06	1.00
ΔSdROS	-.05	-.15	-.99***	-.08
ΔSG	.12	.24**	.13	-.17
ΔPR	-.02	.40***	.19	-.32***

	ΔSdROS	ΔSG	ΔPR
ΔSdROS	1.00		
ΔSG	-.12	1.00	
ΔPR	-.18	.17	1.00

1: Correlation coefficient

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.30 Factor Analysis of Non-Triad-Region Diversification Components

Initial Statistics:

FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
1	2.52983	84.3	84.3
2	.40505	13.5	97.8
3	.06512	2.2	100.0

Factor matrix:

	FACTOR 1
ΔGLNNT	.84165
ΔGUDNT	.95387
ΔGRDNT	.95477

The use of the factor ΔGDnt instead of the changes in the components of global diversification in non-triad countries made it impossible to test hypotheses 8a to 8d because all components were represented by one factor and, therefore, no interactive effect was studied. As a consequence of the change, Hypotheses 8a to 8d were dropped and Hypotheses 7a to 7d were modified as follows:

Hypothesis 7a': For firms in low-tech industries, changes in global diversification in non-triad countries (ΔGDnt) are positively related to changes in firm profitability.

Hypothesis 7b': For firms in low-tech industries, changes in global diversification in non-triad countries (ΔGDnt) are positively related to changes in the stability of firm profitability.

Hypothesis 7c': For firms in low-tech industries, changes in global diversification in non-triad countries (ΔGDnt) are positively related to changes in sales growth.

Hypothesis 7d': For firms in low-tech industries, changes in global diversification in non-triad countries (ΔGDnt) are positively related to changes in stock market performance.

The result of factor analysis also shows that all factor coefficients were positive. That means all three global diversification components were positively correlated with the factor formed. This implies that if firms in low-tech industries diversify their operations in non-triad countries, they tend to use both global unrelated diversification and global related diversification.

Concerning the examination of assumptions of regression, no violations of homoscedasticity and independence of the error term were found. Outliers were discarded in order to maintain normality of the error term distribution. The number of outliers discarded in each analysis is shown in the respective table of regression results.

The regression results of ΔGDnt as the main global diversification variable and ΔSIZE as the control variable are shown in Tables 6.31 to 6.36. The results show that the size effect was less severe than in previous analyses. Only in two analyses (i.e., when using ΔROA and ΔSG as the

Table 6.31 Hierarchical Regression Results of Control Variable (Step 1), and Non-Triad-Region Diversification Strategy (Step 2) on Improvement in Firm Performance (ΔROA during 1984-88) of Firms Operating in Low-Tech Industries

	Beta (Full sample)	Beta (Without outliers)
Control:		
ΔSIZE	.2389**	.2316*
ΔR^2	.0571**	.0537*
Strategy:		
ΔGDnt	.4530***	.4861***
ΔR^2	.2031***	.2339***
Total R^2	.2602***	.2875***
N	70	67
No. of outliers	3	
Avg $\lvert z \rvert$ of outliers	2.7168	

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.32 Hierarchical Regression Results of Control Variable (Step 1), and Non-Triad-Region Diversification Strategy (Step 2) on Improvement in Firm Performance (ΔROS during 1984-88) of Firms Operating in Low-Tech Industries

	Beta (Full sample)	Beta (Without outliers)
Control:		
ΔSIZE	-.1054	-.0450
ΔR^2	.0111	.0020
Strategy:		
ΔGDnt	-.0240	-.0551
ΔR^2	.0006	.0105
Total R^2	.0117	.0125
N	70	66
No. of outliers	4	
Avg $\lvert z \rvert$ of outliers	3.7715	

* p < .10
** p < .05
*** p < .01

Table 6.33 Hierarchical Regression Results of Control Variable (Step 1), and Non-Triad-Region Diversification Strategy (Step 2) on Improvement in Firm Performance (ΔSdROA during 1984-88) of Firms Operating in Low-Tech Industries

	Beta (Full sample)	Beta (Without outliers)
Control:		
ΔSIZE	-.2065*	-.2060*
ΔR^2	.0427*	.0424*
Strategy:		
ΔGDnt	-.6558***	-.6579***
ΔR^2	.4256***	.4286***
Total R^2	.4683***	.4710***
N	70	68
No. of outliers	2	
Avg $\lvert z \rvert$ of outliers	3.0110	

* p < .10
** p < .05
*** p < .01

Table 6.34 Hierarchical Regression Results of Control Variable (Step 1), and Non-Triad-Region Diversification Strategy (Step 2) on Improvement in Firm Performance (ΔSdROS during 1984-88) of Firms Operating in Low-Tech Industries

	Beta (Full sample)	Beta (Without outliers)
Control:		
ΔSIZE	.1135	.0602
ΔR^2	.0129	.0036
Strategy:		
ΔGDnt	.0417	-.0734
ΔR^2	.0017	.0053
Total R^2	.0146	.0090
N	70	66
No. of outliers	4	
Avg $\lvert z \rvert$ of outliers	3.7945	

* p < .10
** p < .05
*** p < .01

Table 6.35 Hierarchical Regression Results of Control Variable (Step 1), and Non-Triad-Region Diversification Strategy (Step 2) on Improvement in Firm Performance (ΔSG during 1984-88) of Firms Operating in Low-Tech Industries

	Beta (Full sample)	Beta (Without outliers)
Control:		
ΔSIZE	-.1394	-.5203***
ΔR^2	.0194	.2706***
Strategy:		
ΔGDnt	.0829	.2491**
ΔR^2	.0068	.0614**
Total R^2	.0263	.3320***
N	70	65
No. of outliers	5	
Avg $\lvert z \rvert$ of outliers	3.4997	

* p < .10
** p < .05
*** p < .01

Table 6.36 Hierarchical Regression Results of Control Variable (Step 1), and Non-Triad-Region Diversification Strategy (Step 2) on Improvement in Firm Performance (ΔPR during 1984-88) of Firms Operating in Low-Tech Industries

	Beta (Full sample)	Beta (Without outliers)
Control:		
ΔSIZE	-.2380*	-.2355*
ΔR^2	.0567*	.0555*
Strategy:		
ΔGDnt	-.0685	-.0843
ΔR^2	.0047	.0071
Total R^2	.0614	.0625
N	70	65
No. of outliers	3	
Cases without data	2	
Avg $\lvert z \rvert$ of outliers	3.1528	

* p < .10
** p < .05
*** p < .01

dependent variables in the analyses of the full sample and the sample without outliers, respectively) was the effect of the change in firm size significant at the 0.05 level.

Full sample. The regression analysis of the full sample show that the change in diversification in non-triad countries (ΔGDnt), after controlling for the change in firm size, had a significant positive impact ($p < 0.01$) on ΔROA and a significant negative impact ($p < 0.01$) on ΔSdROA.

Sample without outliers. The regression analysis of the sample without outliers show that the change in global diversification in non-triad countries (ΔGDnt) had a significant positive impact on ΔROA ($p < 0.01$) and ΔSG ($p < 0.05$) and a significant negative impact on ΔSdROA ($p < 0.01$). The change in global diversification in non-triad countries (ΔGDnt) had no impact on other performance measures of ΔROS, ΔPR and ΔSdROS. The following paragraphs will elaborate on these significant findings.

Impact on ΔROA:

Table 6.31 shows that ΔGDnt had a significant impact ($p < 0.01$) on ΔROA. This indicates that increasing global diversification in non-triad countries can improve the ROA of firms operating in low-tech industries.

Impact on ΔSdROA:

Table 6.33 shows that ΔGDnt had a significant negative impact ($p < 0.01$) on ΔSdROA. This implies that increasing global diversification in non-triad countries can increase the stability of ROA for firms operating in low-tech industries.

Impact on ΔSG:

As shown in Table 6.35, ΔGDnt had a significant impact ($p < 0.05$) on ΔSG. This indicates that increasing global diversification in non-triad countries can improve the sales growth of firms operating in low-tech industries.

Summary of impact of diversification in non-triad countries:

The results of the full sample indicates that Hypotheses 7a' and 7b' are supported while Hypotheses 7c' and 7d' are rejected.

The results of the sample without outliers show that ΔGDnt had a positive impact on ΔROA, ΔSG and the change in the stability of ROA, but no impact on ΔROS, ΔPR and ΔSdROS. Although ΔGDnt did not significantly influence every performance measures used in this study, it influenced measures associated with changes in profitability (ΔROA), the stability of profitability (ΔSdROA) and sales growth (ΔSG). Therefore, Hypotheses 7a', 7b', and 7c' are supported and Hypothesis 7d' is rejected.

Comparisons of Diversification Measures

GODI, the measure of global diversification used in this study, was compared with Kim's global diversification measure and Palepu's diversification measure by means of the usefulness analysis described in Chapter 5. Data for the years 1984 and 1988, as well as the change between these two years were used. As before, outliers were discarded in regression analysis. The results of both full sample and the sample without outliers are provided. Only the results of the sample without outliers will be interpreted in detail.

GODI vs Kim's Global Diversification Measure:

GODI consists of three components, namely, GLN, GUD and GRD. Kim's global diversification measure also consists of three components -- unrelated diversification (UD), global market diversification (GMD) and global related diversification (GRD). The GRD of both measures is identical. Therefore, GRD was entered only once in the hierarchical regression in order to avoid double entry. That is, GRD was entered in the first step of the analysis with the control variable (i.e., the firm size) and the other diversification components, but not in the second step. The summary statistics of the concerned variables for the three different time periods are shown in Tables 6.37 to 6.39. As these tables show, there were significant positive correlations between the components from different diversification measures if they were of a similar nature: GODI's GLN and Kim's GMD, and GODI's GUD and Kim's UD.

As shown in Tables 6.37 to 6.39, components of GODI were highly correlated with Kim's components. This would cause multicollinearity problem in the regression analysis. However, as the focus of regression analyses in this section was on the increment in explained variance,

Table 6.37 Summary Statistics of the 1984 Data for the Comparison between GODI and Kim's Global Diversification Measure

	Mean (S.D.)	UD	GMD	GRD
UD	1.01(.52)	1.00[1]		
GMD	.26(.32)	.05	1.00	
GRD	.57(.39)	-.26***	-.27***	1.00
SIZE		.27***	.35***	.29***
GLN		.16**	.95***	-.31***
GUD		.95***	-.13*	-.18**
ROA		.03	.15**	-.02
ROS		.12	.22***	-.13*
SdROA		-.22***	-.07	-.02
SdROS		-.38***	-.13*	.12
SG		-.06	-.07	.03
PR		.05	-.01	-.06

1: Correlation coefficient

* p < .10
** p < .05
*** p < .01

Table 6.38 Summary Statistics of the 1988 Data for the Comparison between GODI and Kim's Global Diversification Measure

	Mean (S.D.)	UD	GMD	GRD
UD	1.07(.49)	1.00[1]		
GMD	.29(.35)	.02	1.00	
GRD	.52(.36)	-.22***	-.05	1.00
SIZE		.28***	.37***	.38***
GLN		.13*	.94***	-.12
GUD		.92***	-.17**	-.15**
ROA		.05	.15**	.07
ROS		.22***	.13*	-.10
SdROA		-.15**	-.11	-.09
SdROS		-.23***	-.11	.10
SG		-.03	.02	-.01
PR		-.06	.08	.01

1: Correlation coefficient

* p < .10
** p < .05
*** p < .01

Table 6.39 Summary Statistics of the Data on the Changes between 1984 and 1988 for the Comparison between GODI and Kim's Global Diversification Measure

	Mean (S.D.)	ΔUD	ΔGMD	ΔGRD
ΔUD	.06(.38)	1.00[1]		
ΔGMD	.04(.14)	-.07	1.00	
ΔGRD		-.38***	.08	1.00
ΔSIZE		.09	.17**	.09
ΔGLN		.17**	.74***	-.01
ΔGUD		.96***	-.00	-.36***
ΔROA		.16**	.14*	.04
ΔROS		.05	-.03	.09
ΔSdROA		-.26***	-.16**	-.04
ΔSdROS		-.06	.04	-.08
ΔSG		.05	.08	-.04
ΔPR		-.03	-.05	-.02

1: Correlation coefficient

* $p < .10$
** $p < .05$
*** $p < .01$

not the relationship between variables, multicollinearity seemed not a problem to be worried about.

The regression results of the usefulness analysis are shown in Tables 6.40 to 6.57. Because the data used for the analysis were same as that in cross-sectional and dynamic analyses before, the results of the examination of the regression assumptions found before also applied here.

Full sample. From Tables 6.40 to 6.57, the results of the full sample show that there was no significant difference between two measures with respect to both cross-sectional and dynamic analyses.

Sample without outliers. The results of the sample without outliers were, however, not the same as above. The analyses using the data of years 1984 and 1988 show that there was no significant difference between two measures. But from Tables 6.52 to 6.57, the analyses using the data of the changes between 1984 and 1988 show that GODI significantly explained ($p < 0.05$) more residual variance than Kim's measure in terms of ΔROA (Table 6.52), ΔROS (Table 6.53) and ΔSdROS (Table 6.55).

GODI vs Palepu's Diversification Measure:

Palepu's diversification measure consists of two components -- unrelated diversification (UD) and related

Table 6.40 Comparison between GODI and Kim's Measure by Hierarchical Regression Using Firm Performance (1984 ROA) as Dependent Variable

Full sample:

Control & GODI:		Control & Kim's:	
SIZE	.1966**	SIZE	.1747
GLN	-.0060	UD	-.0367
GUD	-.0134	GMD	.0744
GRD	-.0763	GRD	-.0587
ΔR^2	.0356	ΔR^2	.0415
Kim's:		GODI:	
UD	na	GLN	-.5735**
GMD	.5969**	GUD	na
ΔR^2	.0315**	ΔR^2	.0256**
Total R^2	.0671**	Total R^2	.0671**

N	174
No. of outliers	6
Avg $\lvert z \rvert$ of outliers	3.6471

Sample without outliers:

Control & GODI:		Control & Kim's:	
SIZE	.1359	SIZE	.1073
GLN	-.0111	UD	-.1132
GUD	-.0835	GMD	.0884
GRD	-.1469	GRD	-.1253
ΔR^2	.0246	ΔR^2	.0384
Kim's:		GODI:	
UD	na	GLN	-.7374***
GMD	.8047***	GUD	na
ΔR^2	.0536***	ΔR^2	.0398***
Total R^2	.0782**	Total R^2	.0782**
N	168		

* p < .10
** p < .05
*** p < .01

Table 6.41 Comparison between GODI and Kim's Measure by Hierarchical Regression Using Firm Performance (1984 ROS) as Dependent Variable

Full sample:

Control & GODI:		Control & Kim's:	
SIZE	.0780	SIZE	.0730
GLN	.1683*	UD	.0689
GUD	.0596	GMD	.1665*
GRD	-.0922	GRD	-.0904*
ΔR^2	.0636**	ΔR^2	.0659**
Kim's:		GODI:	
UD	na	GLN	-.0495
GMD	-.1680	GUD	na
ΔR^2	.0025	ΔR^2	.0002
Total R^2	.0661**	Total R^2	.0661**

N	174
No. of outliers	4
Avg $\lvert z \rvert$ of outliers	4.3413

Sample without outliers:

Control & GODI:		Control & Kim's:	
SIZE	.1055	SIZE	.1084
GLN	.1742*	UD	.0580
GUD	.0419	GMD	.1544*
GRD	-.1566	GRD	-.1622*
ΔR^2	.0911***	ΔR^2	.0893***
Kim's:		GODI:	
UD	na	GLN	-.1574
GMD	-.0193	GUD	na
ΔR^2	.0000	ΔR^2	.0018
Total R^2	.0911***	Total R^2	.0911***

N 170

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.42 Comparison between GODI and Kim's Measure by Hierarchical Regression Using Firm Performance (1984 SdROA) as Dependent Variable

Full sample:

Control & GODI:		Control & Kim's:	
SIZE	-.1797*	SIZE	-.1688*
GLN	-.0097	UD	-.1793**
GUD	-.1941**	GMD	-.0051
GRD	-.0104	GRD	-.0225
ΔR^2	.0856***	ΔR^2	.0783***
Kim's:		GODI:	
UD	na	GLN	.4073
GMD	-.2521	GUD	na
ΔR^2	.0056	ΔR^2	.0129
Total R^2	.0912***	Total R^2	.0912***

N	174
No. of outliers	3
Avg $\lvert z \rvert$ of outliers	5.5912

Sample without outliers:

Control & GODI:		Control & Kim's:	
SIZE	-.1736*	SIZE	-.1660*
GLN	-.0095	UD	-.2120**
GUD	-.2229***	GMD	.0141
GRD	-.0364	GRD	-.0445
ΔR^2	.0961***	ΔR^2	.0900***
Kim's:		GODI:	
UD	na	GLN	.3249
GMD	-.1412	GUD	na
ΔR^2	.0017	ΔR^2	.0078
Total R^2	.0978***	Total R^2	.0978***
N	171		

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.43 Comparison between GODI and Kim's Measure by Hierarchical Regression Using Firm Performance (1984 SdROS) as Dependent Variable

Full sample:

Control & GODI:		Control & Kim's:	
SIZE	.0028	SIZE	-.0036
GLN	-.2043**	UD	-.3715***
GUD	-.3518***	GMD	-.1110
GRD	-.0074	GRD	-.0042
ΔR^2	.1515***	ΔR^2	.1542***
Kim's:		**GODI:**	
UD	na	GLN	-.0984
GMD	.1992	GUD	na
ΔR^2	.0035	ΔR^2	.0008
Total R^2	.1550***	Total R^2	.1550***

N	174
No. of outliers	3
Avg $\lvert z \rvert$ of outliers	4.4889

Sample without outliers:

Control & GODI:		Control & Kim's:	
SIZE	-.0404	SIZE	-.0500
GLN	-.1995**	UD	-.4278***
GUD	-.4074***	GMD	-.0861
GRD	-.0108	GRD	-.0061
ΔR^2	.2019***	ΔR^2	.2082***
Kim's:		**GODI:**	
UD	na	GLN	-.1446
GMD	.2994	GUD	na
ΔR^2	.0080	ΔR^2	.0017
Total R^2	.2099***	Total R^2	.2099***

N 171

* p < .10
** p < .05
*** p < .01

Table 6.44 Comparison between GODI and Kim's Measure by Hierarchical Regression Using Firm Performance (1984 SG) as Dependent Variable

Full sample:

Control & GODI:		Control & Kim's:	
SIZE	.0413	SIZE	.0339
GLN	-.1193	UD	-.0685
GUD	-.0499	GMD	-.0834
GRD	-.0238	GRD	-.0161
ΔR^2	.0109	ΔR^2	.0087
Kim's:		GODI:	
UD	na	GLN	-.2545
GMD	.1800	GUD	na
ΔR^2	.0029	ΔR^2	.0050
Total R^2	.0138	Total R^2	.0138

N	174
No. of outliers	4
Avg $\lvert z \rvert$ of outliers	5.2338

Sample without outliers:

Control & GODI:		Control & Kim's:	
SIZE	.2705***	SIZE	.2609***
GLN	-.1593	UD	-.0474
GUD	-.0224	GMD	-.1208
GRD	-.1970**	GRD	-.1863*
ΔR^2	.0518*	ΔR^2	.0460*
Kim's:		GODI:	
UD	na	GLN	-.3589
GMD	.2217	GUD	na
ΔR^2	.0043	ΔR^2	.0101
Total R^2	.0561*	Total R^2	.0561*

N 170

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* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.45 Comparison between GODI and Kim's Measure by Hierarchical Regression Using Firm Performance (1984 PR) as Dependent Variable

Full sample:

Control & GODI:		Control & Kim's:	
SIZE	.0263	SIZE	.0370
GLN	-.0078	UD	.0227
GUD	.0110	GMD	-.0436
GRD	-.0630	GRD	-.0718
ΔR^2	.0038	ΔR^2	.0058
Kim's:		**GODI:**	
UD	na	GLN	.3357
GMD	-.3532	GUD	na
ΔR^2	.0098	ΔR^2	.0078
Total R^2	.0136	Total R^2	.0136

N	174
No. of outliers	3
Cases without data	6
Avg $\lvert z \rvert$ of outliers	4.8505

Sample without outliers:

Control & GODI:		Control & Kim's:	
SIZE	.0481	SIZE	.0515
GLN	.0704	UD	.0627
GUD	.0534	GMD	.0477
GRD	.0712	GRD	.0680
ΔR^2	.0153	ΔR^2	.0150
Kim's:		**GODI:**	
UD	na	GLN	.1245
GMD	-.0999	GUD	na
ΔR^2	.0008	ΔR^2	.0011
Total R^2	.0161	Total R^2	.0161

N 165

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* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.46 Comparison between GODI and Kim's Measure by Hierarchical Regression Using Firm Performance (1988 ROA) as Dependent Variable

Full sample:

Control & GODI:		Control & Kim's:	
SIZE	.2088**	SIZE	.2129**
GLN	.0719	UD	-.0139
GUD	-.0179	GMD	.0731
GRD	.0004	GRD	-.0057
ΔR^2	.0600**	ΔR^2	.0598**
Kim's:		**GODI:**	
UD	na	GLN	.0547
GMD	.0367	GUD	na
ΔR^2	.0002	ΔR^2	.0003
Total R^2	.0601**	Total R^2	.0601**

N	189
No. of outliers	5
Avg $\lvert z \rvert$ of outliers	4.0612

Sample without outliers:

Control & GODI:		Control & Kim's:	
SIZE	.1388	SIZE	.1425
GLN	.1311	UD	-.0112
GUD	-.0100	GMD	.1419
GRD	.0167	GRD	.0067
ΔR^2	.0523**	ΔR^2	.0552**
Kim's:		**GODI:**	
UD	na	GLN	-.0094
GMD	.1578	GUD	na
ΔR^2	.0031	ΔR^2	.0000
Total R^2	.0552*	Total R^2	.0552*

N 184

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* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.47 Comparison between GODI and Kim's Measure by Hierarchical Regression Using Firm Performance (1988 ROS) as Dependent Variable

Full sample:

Control & GODI:		Control & Kim's:	
SIZE	.0810	SIZE	.0871
GLN	.1592*	UD	.1716**
GUD	.1469*	GMD	.0932
GRD	-.0855	GRD	-.0863
ΔR^2	.0694***	ΔR^2	.0699***
Kim's:		**GODI:**	
UD	na	GLN	.2122
GMD	-.2092	GUD	na
ΔR^2	.0053	ΔR^2	.0049
Total R^2	.0747**	Total R^2	.0747**

N	189
No. of outliers	8
Avg $\lvert z \rvert$ of outliers	4.0345

Sample without outliers:

Control & GODI:		Control & Kim's:	
SIZE	-.0182	SIZE	-.0100
GLN	.1551	UD	.1641*
GUD	.1355	GMD	.0826
GRD	.0342	GRD	.0326
ΔR^2	.0297	ΔR^2	.0302
Kim's:		**GODI:**	
UD	na	GLN	.2953
GMD	-.2860	GUD	na
ΔR^2	.0099	ΔR^2	.0094
Total R^2	.0396	Total R^2	.0396

N	181

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.48 Comparison between GODI and Kim's Measure by Hierarchical Regression Using Firm Performance (1988 SdROA) as Dependent Variable

Full sample:

Control & GODI:		Control & Kim's:	
SIZE	-.1979**	SIZE	-.1967**
GLN	-.0611	UD	-.0993
GUD	-.0959	GMD	-.0363
GRD	-.0402	GRD	-.0425
ΔR^2	.0724***	ΔR^2	.0724***
Kim's:		**GODI:**	
UD	na	GLN	.0086
GMD	.0274	GUD	na
ΔR^2	.0001	ΔR^2	.0000
Total R^2	.0725**	Total R^2	.0724**

N	189
No. of outliers	5
Avg $\lvert z \rvert$ of outliers	4.5102

Sample without outliers:

Control & GODI:		Control & Kim's:	
SIZE	-.2173**	SIZE	-.2096**
GLN	-.0348	UD	-.1049
GUD	-.1171	GMD	-.0290
GRD	-.0423	GRD	-.0477
ΔR^2	.0822***	ΔR^2	.0797***
Kim's:		**GODI:**	
UD	na	GLN	.1980
GMD	-.1224	GUD	na
ΔR^2	.0019	ΔR^2	.0043
Total R^2	.0840***	Total R^2	.0840***

N 184

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.49 Comparison between GODI and Kim's Measure by Hierarchical Regression Using Firm Performance (1988 SdROS) as Dependent Variable

Full sample:

Control & GODI:		Control & Kim's:	
SIZE	-.0771	SIZE	-.0814
GLN	-.1449*	UD	-.1915**
GUD	-.1683**	GMD	-.0756
GRD	.0825	GRD	.0808
ΔR^2	.0698***	ΔR^2	.0719***
Kim's:		GODI:	
UD	na	GLN	-.1841
GMD	.2171	GUD	na
ΔR^2	.0057	ΔR^2	.0037
Total R^2	.0756**	Total R^2	.0756**

N	189
No. of outliers	8
Avg |z| of outliers	4.0810

Sample without outliers:

Control & GODI:		Control & Kim's:	
SIZE	.0276	SIZE	.0233
GLN	-.1202	UD	-.2230***
GUD	-.1971**	GMD	-.0348
GRD	-.0461	GRD	-.0503
ΔR^2	.0377	ΔR^2	.0446*
Kim's:		GODI:	
UD	na	GLN	-.2419
GMD	.3300	GUD	na
ΔR^2	.0132	ΔR^2	.0063
Total R^2	.0509	Total R^2	.0509

N	181

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.50 Comparison between GODI and Kim's Measure by Hierarchical Regression Using Firm Performance (1988 SG) as Dependent Variable

Full sample:

Control & GODI:		Control & Kim's:	
SIZE	.0713	SIZE	.0752
GLN	-.0147	UD	-.0649
GUD	-.0691	GMD	-.0063
GRD	-.0469	GRD	-.0506
ΔR^2	.0057	ΔR^2	.0050
Kim's:		**GODI:**	
UD	na	GLN	.0842
GMD	-.0313	GUD	na
ΔR^2	.0001	ΔR^2	.0008
Total R^2	.0058	Total R^2	.0058

N	189
No. of outliers	4
Avg $\lvert z \rvert$ of outliers	5.2005

Sample without outliers:

Control & GODI:		Control & Kim's:	
SIZE	.2076	SIZE	.2143
GLN	-.0405	UD	-.1006
GUD	-.1102	GMD	-.0329
GRD	-.0742	GRD	-.0792
ΔR^2	.0312	ΔR^2	.0294
Kim's:		**GODI:**	
UD	na	GLN	.1697
GMD	-.1057	GUD	na
ΔR^2	.0014	ΔR^2	.0031
Total R^2	.0325	Total R^2	.0325

N	185

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* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.51 Comparison between GODI and Kim's Measure by Hierarchical Regression Using Firm Performance (1988 PR) as Dependent Variable

Full sample:

Control & GODI:		Control & Kim's:	
SIZE	-.1036	SIZE	-.0989
GLN	.1106	UD	-.0249
GUD	-.0265	GMD	.1195
GRD	.0613	GRD	.0515
ΔR^2	.0147	ΔR^2	.0162
Kim's:		GODI:	
UD	na	GLN	.0313
GMD	.1107	GUD	na
ΔR^2	.0015	ΔR^2	.0001
Total R^2	.0163	Total R^2	.0163

N	189
No. of outliers	2
Cases without data	5
Avg $\lvert z \rvert$ of outliers	4.6528

Sample without outliers:

Control & GODI:		Control & Kim's:	
SIZE	.0183	SIZE	.0195
GLN	.0525	UD	-.0234
GUD	-.0208	GMD	.0642
GRD	.0018	GRD	-.0036
ΔR^2	.0045	ΔR^2	.0057
Kim's:		GODI:	
UD	na	GLN	-.0210
GMD	.0987	GUD	na
ΔR^2	.0012	ΔR^2	.0000
Total R^2	.0057	Total R^2	.0057

N 182

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.52 Comparison between GODI and Kim's Measure by Hierarchical Regression Using Improvement in Firm Performance (ΔROA during 1984-88) as Dependent Variable

Full sample:

Control & GODI:		Control & Kim's:	
ΔSIZE	.3185***	ΔSIZE	.3174***
ΔGLN	.1032	ΔUD	.1616*
ΔGUD	.1467*	ΔGMD	.0947
ΔGRD	.0678	ΔGRD	.0667
ΔR^2	.1549***	ΔR^2	.1548***
Kim's:		**GODI:**	
ΔUD	na	ΔGLN	.0240
ΔGMD	.0182	ΔGUD	na
ΔR^2	.0002	ΔR^2	.0002
Total R^2	.1550***	Total R^2	.1550***

N	152
No. of outliers	6
Avg |z| of outliers	3.4256

Sample without outliers:

Control & GODI:		Control & Kim's:	
ΔSIZE	.2194***	ΔSIZE	.2154**
ΔGLN	.1899**	ΔUD	.0335
ΔGUD	-.0314	ΔGMD	.0819
ΔGRD	-.0339	ΔGRD	-.0185
ΔR^2	.0853**	ΔR^2	.0552*
Kim's:		**GODI:**	
ΔUD	na	ΔGLN	.3167**
ΔGMD	-.1509	ΔGUD	na
ΔR^2	.0098	ΔR^2	.0398**
Total R^2	.0950**	Total R^2	.0950**
N	146		

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.53 Comparison between GODI and Kim's Measure by Hierarchical Regression Using Improvement in Firm Performance (ΔROS during 1984-88) as Dependent Variable

Full sample:

Control & GODI:		Control & Kim's:	
ΔSIZE	-.0029	ΔSIZE	.0056
ΔGLN	.0547	ΔUD	.0974
ΔGUD	.0584	ΔGMD	-.0315
ΔGRD	.1162	ΔGRD	.1331
ΔR^2	.0149	ΔR^2	.0183
Kim's:		GODI:	
ΔUD	na	ΔGLN	.1531
ΔGMD	-.1700	ΔGUD	na
ΔR^2	.0128	ΔR^2	.0094
Total R^2	.0277	Total R^2	.0277

N	152
No. of outliers	6
Avg |z| of outliers	4.1599

Sample without outliers:

Control & GODI:		Control & Kim's:	
ΔSIZE	.0916	ΔSIZE	.1021
ΔGLN	.1744**	ΔUD	.0038
ΔGUD	-.0845	ΔGMD	.0164
ΔGRD	-.0056	ΔGRD	.0248
ΔR^2	.0472	ΔR^2	.0124
Kim's:		GODI:	
ΔUD	na	ΔGLN	.3936***
ΔGMD	-.2479**	ΔGUD	na
ΔR^2	.0268**	ΔR^2	.0615***
Total R^2	.0740*	Total R^2	.0739*
N	146		

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* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.54 Comparison between GODI and Kim's Measure by Hierarchical Regression Using Improvement in Firm Performance (ΔSdROA during 1984-88) as Dependent Variable

Full sample:

Control & GODI:		Control & Kim's:	
ΔSIZE	-.3561***	ΔSIZE	-.3545***
ΔGLN	-.1099	ΔUD	-.2762***
ΔGUD	-.2671***	ΔGMD	-.1130
ΔGRD	-.1030	ΔGRD	-.0998
ΔR^2	.2399***	ΔR^2	.2399***
Kim's:		GODI:	
ΔUD	na	ΔGLN	.0332
ΔGMD	-.0319	ΔGUD	na
ΔR^2	.0005	ΔR^2	.0004
Total R^2	.2403***	Total R^2	.2403***

N	152
No. of outliers	4
Avg $\lvert z \rvert$ of outliers	4.5832

Sample without outliers:

Control & GODI:		Control & Kim's:	
ΔSIZE	-.1926**	ΔSIZE	-.1909**
ΔGLN	-.1599**	ΔUD	-.1438
ΔGUD	-.1088	ΔGMD	-.1188
ΔGRD	-.0329	ΔGRD	.0287
ΔR^2	.0772**	ΔR^2	.0705**
Kim's:		GODI:	
ΔUD	na	ΔGLN	-.1265
ΔGMD	.0199	ΔGUD	na
ΔR^2	.0002	ΔR^2	.0069
Total R^2	.0774**	Total R^2	.0774**

N 148

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.55 Comparison between GODI and Kim's Measure by Hierarchical Regression Using Improvement in Firm Performance (ΔSdROS during 1984-88) as Dependent Variable

Full sample:

Control & GODI:		Control & Kim's:	
ΔSIZE	.0144	ΔSIZE	.0055
ΔGLN	-.0454	ΔUD	-.1097
ΔGUD	-.0725	ΔGMD	.0402
ΔGRD	-.1116	ΔGRD	-.1288
ΔR^2	.0135	ΔR^2	.0191
Kim's:		GODI:	
ΔUD	na	ΔGLN	-.1417
ΔGMD	.1757	ΔGUD	na
ΔR^2	.0137	ΔR^2	.0081
Total R^2	.0271	Total R^2	.0271

N	152
No. of outliers	6
Avg $\|z\|$ of outliers	4.2202

Sample without outliers:

Control & GODI:		Control & Kim's:	
ΔSIZE	-.0702	ΔSIZE	-.0821
ΔGLN	-.1616*	ΔUD	-.0308
ΔGUD	.0579	ΔGMD	.0035
ΔGRD	.0204	ΔGRD	-.0125
ΔR^2	.0352	ΔR^2	.0081
Kim's:		GODI:	
ΔUD	na	ΔGLN	-.3880***
ΔGMD	.2739**	ΔGUD	na
ΔR^2	.0327**	ΔR^2	.0598***
Total R^2	.0679*	Total R^2	.0679*

N 146

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.56 Comparison between GODI and Kim's Measure by Hierarchical Regression Using Improvement in Firm Performance (ΔSG during 1984-88) as Dependent Variable

Full sample:

Control & GODI:		Control & Kim's:	
ΔSIZE	.0944	ΔSIZE	.0873
ΔGLN	.0093	ΔUD	.0306
ΔGUD	.0545	ΔGMD	.0735
ΔGRD	-.0320	ΔGRD	-.0459
ΔR^2	.0150	ΔR^2	.0182
Kim's:		GODI:	
ΔUD	na	ΔGLN	-.1185
ΔGMD	.1410	ΔGUD	na
ΔR^2	.0088	ΔR^2	.0057
Total R^2	.0238	Total R^2	.0238

N	152
No. of outliers	5
Avg $\lvert z \rvert$ of outliers	4.1527

Sample without outliers:

Control & GODI:		Control & Kim's:	
ΔSIZE	.3174***	ΔSIZE	.3161***
ΔGLN	.0899	ΔUD	-.0695
ΔGUD	-.0801	ΔGMD	.0982
ΔGRD	-.1826**	ΔGRD	-.1878**
ΔR^2	.1302***	ΔR^2	.1312***
Kim's:		GODI:	
ΔUD	na	ΔGLN	.0684
ΔGMD	.0797	ΔGUD	na
ΔR^2	.0030	ΔR^2	.0020
Total R^2	.1332***	Total R^2	.1332***

N 147

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.57 Comparison between GODI and Kim's Measure by Hierarchical Regression Using Improvement in Firm Performance (ΔPR during 1984-88) as Dependent Variable

Full sample:

Control & GODI:		Control & Kim's:	
ΔSIZE	-.2273***	ΔSIZE	-.2257***
ΔGLN	-.0568	ΔUD	-.0388
ΔGUD	-.0238	ΔGMD	-.0356
ΔGRD	-.0116	ΔGRD	-.0147
ΔR^2	.0563*	ΔR^2	.0549*
Kim's:		**GODI:**	
ΔUD	na	ΔGLN	-.0618
ΔGMD	.0207	ΔGUD	na
ΔR^2	.0002	ΔR^2	.0016
Total R^2	.0565	Total R^2	.0565

N	152
No. of outliers	6
Cases without data	8
Avg $\lvert z \rvert$ of outliers	3.0506

Sample without outliers:

Control & GODI:		Control & Kim's:	
ΔSIZE	-.2190**	ΔSIZE	-.2182**
ΔGLN	-.0007	ΔUD	.0597
ΔGUD	.0647	ΔGMD	.0132
ΔGRD	.0099	ΔGRD	.0073
ΔR^2	.0511	ΔR^2	.0505
Kim's:		**GODI:**	
ΔUD	na	ΔGLN	-.0416
ΔGMD	.0190	ΔGUD	na
ΔR^2	.0002	ΔR^2	.0008
Total R^2	.0512	Total R^2	.0512

N 138

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* $p < .10$
** $p < .05$
*** $p < .01$

diversification (RD). These components do not incorporate any consideration of geographic dispersion. The summary statistics of the concerned variables are shown in Tables 6.58 to 6.60. If the components, which came from different diversification measures, were of a similar nature, their correlations were highly significant. These correlations included GODI's GUD with Palepu's UD and GODI's GRD with Palepu's RD.

As shown in Table 6.58 to 6.60, components of GODI were highly correlated with Palepu's components. This would cause multicollinearity problem in the regression analysis. However, as the focus of regression analyses in this section was on the increment in explained variance, not the relationship between variables, multicollinearity seemed not a problem to be worried about.

The regression results of the usefulness analysis are shown in Tables 6.61 to 6.78. Because the data used for the analysis were same as that in cross-sectional and dynamic analyses before, the results of the examination of the regression assumptions found before also applied here.

Full sample. As shown in Tables 6.61 to 6.78, the results of the full sample show that Palepu's measure explained more residual variance than GODI in terms of ROA in 1984 and SdROS in 1988.

Table 6.58 Summary Statistics of the 1984 Data for the Comparison between GODI and Palepu's Diversification Measure

	Mean (S.D.)	UD	RD
UD	1.01(.52)	1.00[1]	
RD	.63(.40)	-.22***	1.00
SIZE		.27***	.37***
GLN		.16**	-.17**
GUD		.95***	-.17**
GRD		-.26***	.97***
ROA		.03	-.01
ROS		.12	-.11
SdROA		-.22***	-.03
SdROS		-.38***	.10
SG		-.06	.01
PR		.05	-.06

1: Correlation coefficient

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.59 Summary Statistics of the 1988 Data for the Comparison between GODI and Palepu's Diversification Measure

	Mean (S.D.)	UD	RD
UD	1.07(.49)	1.00[1]	
RD	.61(.40)	-.17**	1.00
SIZE		.28***	.45***
GLN		.13*	.11
GUD		.92***	-.15**
GRD		-.22***	.94***
ROA		.05	.11
ROS		.22***	-.10
SdROA		-.15**	-.13*
SdROS		-.23***	.10
SG		-.03	.00
PR		-.06	.04

1: Correlation coefficient

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.60 Summary Statistics of the Data on the Changes between 1984 and 1988 for the Comparison between GODI and Palepu's Diversification Measure

	Mean (S.D.)	ΔUD	ΔRD
ΔUD	.06(.38)	1.00[1]	
ΔRD	.00(.35)	-.32***	1.00
ΔSIZE		.09	.11
ΔGLN		.17**	.11
ΔGUD		.96***	-.30***
ΔGRD		-.38***	.95***
ΔROA		.16**	.06
ΔROS		.05	.07
ΔSdROA		-.26***	-.06
ΔSdROS		-.06	-.06
ΔSG		.05	-.04
ΔPR		-.03	-.01

1: Correlation coefficient

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.61 Comparison between GODI and Palepu's Measure by Hierarchical Regression Using Firm Performance (1984 ROA) as Dependent Variable

Full sample:

Control & GODI:		Control & Palepu's:	
SIZE	.1966**	SIZE	.2279**
GLN	.0060	UD	-.0556
GUD	-.0134	RD	-.1050
GRD	-.0763		
ΔR^2	.0356	ΔR^2	.0387*
Palepu's:		GODI:	
UD	-.9926**	GLN	.2830*
RD	-.2466	GUD	.9600**
		GRD	.1736
ΔR^2	.0337*	ΔR^2	.0305
Total R^2	.0693*	Total R^2	.0693*

N	174
No. of outliers	6
Avg $\lvert z \rvert$ of outliers	3.6385

Sample without outliers:

Control & GODI:		Control & Palepu's:	
SIZE	.1359	SIZE	.1761**
GLN	-.0111	UD	-.1355
GUD	-.0835	RD	-.1844**
GRD	-.1469		
ΔR^2	.0246	ΔR^2	.0359
Palepu's:		GODI:	
UD	-1.3139***	GLN	.3545**
RD	-.3524	GUD	1.2087***
		GRD	.2047
ΔR^2	.0582***	ΔR^2	.0469**
Total R^2	.0828**	Total R^2	.0828**

N 168

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.62 Comparison between GODI and Palepu's Measure by Hierarchical Regression Using Firm Performance (1984 ROS) as Dependent Variable

Full sample:

Control & GODI:		Control & Palepu's:	
SIZE	.0780	SIZE	.1756**
GLN	.1683*	UD	.0359
GUD	.0596	RD	-.1655*
GRD	-.0922		
ΔR^2	.0636**	ΔR^2	.0439*
Palepu's:		GODI:	
UD	-.2829	GLN	.2744*
RD	-.2653	GUD	.3395
		GRD	.1758
ΔR^2	.0050	ΔR^2	.0247
Total R^2	.0686*	Total R^2	.0686*

N	174
No. of outliers	4
Avg $\lvert z \rvert$ of outliers	4.3463

Sample without outliers:

Control & GODI:		Control & Palepu's:	
SIZE	.1055	SIZE	.2152**
GLN	.1742*	UD	.0229
GUD	.0419	RD	-.2423***
GRD	-.1566		
ΔR^2	.0911***	ΔR^2	.0722***
Palepu's:		GODI:	
UD	.0270	GLN	.2405
RD	-.5219	GUD	.0222
		GRD	.3699
ΔR^2	.0099	ΔR^2	.0289
Total R^2	.1011***	Total R^2	.1011***

N 170

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.63 Comparison between GODI and Palepu's Measure by Hierarchical Regression Using Firm Performance (1984 SdROA) as Dependent Variable

Full sample:

Control & GODI:		Control & Palepu's:	
SIZE	-.1797*	SIZE	-.1805**
GLN	-.0097	UD	-.1700**
GUD	-.1941**	RD	.0021
GRD	-.0104		
ΔR^2	.0856***	ΔR^2	.0780***
Palepu's:		GODI:	
UD	.4239	GLN	-.1645
RD	.3677	GUD	-.6131
		GRD	-.3818
ΔR^2	.0105	ΔR^2	.0181
Total R^2	.0960***	Total R^2	.0960***

N	174
No. of outliers	3
Avg $\lvert z \rvert$ of outliers	5.5571

Sample without outliers:

Control & GODI:		Control & Palepu's:	
SIZE	-.1736*	SIZE	-.1666*
GLN	-.0095	UD	-.2047**
GUD	-.2229***	RD	-.0241
GRD	-.0364		
ΔR^2	.0961***	ΔR^2	.0882***
Palepu's:		GODI:	
UD	.2482	GLN	-.1350
RD	.4654	GUD	-.4722
		GRD	-.5066
ΔR^2	.0094	ΔR^2	.0173
Total R^2	.1055***	Total R^2	.1055***

N 171

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.64 Comparison between GODI and Palepu's Measure by Hierarchical Regression Using Firm Performance (1984 SdROS) as Dependent Variable

Full sample:

Control & GODI:		Control & Palepu's:	
SIZE	.0028	SIZE	-.0651
GLN	-.2043**	UD	-.3497***
GUD	-.3518***	RD	.0417
GRD	-.0074		
ΔR^2	.1515***	ΔR^2	.1451***
Palepu's:		GODI:	
UD	-.3278	GLN	-.1401
RD	.1144	GUD	-.0329
		GRD	-.1224
ΔR^2	.0040	ΔR^2	.0104
Total R^2	.1555***	Total R^2	.1555***

N	174
No. of outliers	3
Avg $\lvert z \rvert$ of outliers	4.4809

Sample without outliers:

Control & GODI:		Control & Palepu's:	
SIZE	-.0404	SIZE	-.1002
GLN	-.1995**	UD	-.4081***
GUD	-.4074***	RD	.0353
GRD	-.0108		
ΔR^2	.2019***	ΔR^2	.2031***
Palepu's:		GODI:	
UD	-.4901	GLN	-.1109
RD	.2307	GUD	.0703
		GRD	-.2426
ΔR^2	.0099	ΔR^2	.0087
Total R^2	.2118***	Total R^2	.2118***

N 171

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.65 Comparison between GODI and Palepu's Measure by Hierarchical Regression Using Firm Performance (1984 SG) as Dependent Variable

Full sample:

Control & GODI:		Control & Palepu's:	
SIZE	.0413	SIZE	-.0004
GLN	-.1193	UD	-.0601
GUD	-.0499	RD	-.0052
GRD	-.0238		
ΔR^2	.0109	ΔR^2	.0035
Palepu's:		GODI:	
UD	-.3043	GLN	.0052
RD	-.3603	GUD	.2521
		GRD	.3400
ΔR^2	.0075	ΔR^2	.0149
Total R^2	.0184	Total R^2	.0184

N	174
No. of outliers	3
Avg $\lvert z \rvert$ of outliers	6.1298

Sample without outliers:

Control & GODI:		Control & Palepu's:	
SIZE	.2576**	SIZE	.2196**
GLN	-.1652*	UD	-.1051
GUD	-.0899	RD	-.2227**
GRD	-.2465**		
ΔR^2	.0494*	ΔR^2	.0489**
Palepu's:		GODI:	
UD	-.5666	GLN	.0394
RD	-.4785	GUD	.4705
		GRD	.2360
ΔR^2	.0184	ΔR^2	.0189
Total R^2	.0678*	Total R^2	.0678*

N 171

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.66 Comparison between GODI and Palepu's Measure by Hierarchical Regression Using Firm Performance (1984 PR) as Dependent Variable

Full sample:

Control & GODI:		Control & Palepu's:	
SIZE	.0263	SIZE	.0240
GLN	-.0078	UD	.0287
GUD	.0110	RD	-.0654
GRD	-.0630		
ΔR^2	.0038	ΔR^2	.0057
Palepu's:		GODI:	
UD	.5734	GLN	-.1024
RD	-.2812	GUD	-.5464
		GRD	.2214
ΔR^2	.0127	ΔR^2	.0108
Total R^2	.0165	Total R^2	.0165

N	174
No. of outliers	3
Cases without data	6
Avg $\lvert z \rvert$ of outliers	4.8445

Sample without outliers:

Control & GODI:		Control & Palepu's:	
SIZE	.0481	SIZE	.0811
GLN	.0704	UD	.0448
GUD	.0534	RD	.0278
GRD	.0712		
ΔR^2	.0153	ΔR^2	.0125
Palepu's:		GODI:	
UD	.1500	GLN	.1007
RD	-.4668	GUD	-.0867
		GRD	.5425
ΔR^2	.0089	ΔR^2	.0117
Total R^2	.0242	Total R^2	.0242

N 165

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.67 Comparison between GODI and Palepu's Measure by Hierarchical Regression Using Firm Performance (1988 ROA) as Dependent Variable

Full sample:

Control & GODI:		Control & Palepu's:	
SIZE	.2088**	SIZE	.2389***
GLN	.0719	UD	-.0187
GUD	-.0179	RD	.0005
GRD	.0004		
ΔR^2	.0600**	ΔR^2	.0550**
Palepu's:		GODI:	
UD	-.0145	GLN	.0510
RD	.1019	GUD	-.0078
		GRD	-.1008
ΔR^2	.0007	ΔR^2	.0056
Total R^2	.0607*	Total R^2	.0607*

N	189
No. of outliers	5
Avg $\lvert z \rvert$ of outliers	4.0502

Sample without outliers:

Control & GODI:		Control & Palepu's:	
SIZE	.1388	SIZE	.1918**
GLN	.1311	UD	-.0218
GUD	-.0100	RD	.0184
GRD	.0167		
ΔR^2	.0522**	ΔR^2	.0387*
Palepu's:		GODI:	
UD	-.1542	GLN	.1282
RD	.1848	GUD	.1311
		GRD	-.1730
ΔR^2	.0049	ΔR^2	.0184
Total R^2	.0570	Total R^2	.0570

N	184

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.68 Comparison between GODI and Palepu's Measure by Hierarchical Regression Using Firm Performance (1988 ROS) as Dependent Variable

Full sample:

Control & GODI:		Control & Palepu's:	
SIZE	.0810	SIZE	.1621*
GLN	.1592*	UD	.1449*
GUD	.1469*	RD	-.1449*
GRD	-.0855		
ΔR^2	.0694***	ΔR^2	.0677***
Palepu's:		GODI:	
UD	.0102	GLN	.3483**
RD	-.7884**	GUD	.1663
		GRD	.6924**
ΔR^2	.0377**	ΔR^2	.0394**
Total R^2	.1071***	Total R^2	.1071***

N	189
No. of outliers	6
Avg $\lvert z \rvert$ of outliers	4.4521

Sample without outliers:

Control & GODI:		Control & Palepu's:	
SIZE	-.0699	SIZE	.0409
GLN	.2613***	UD	.1921**
GUD	.2024**	RD	-.0467
GRD	.0231		
ΔR^2	.0743***	ΔR^2	.0465**
Palepu's:		GODI:	
UD	-.0616	GLN	.4767***
RD	-.8109**	GUD	.2909
		GRD	.8191**
ΔR^2	.0376**	ΔR^2	.0653***
Total R^2	.1118***	Total R^2	.1118***

N 183

* p < .10
** p < .05
*** p < .01

Table 6.69 Comparison between GODI and Palepu's Measure by Hierarchical Regression Using Firm Performance (1988 SdROA) as Dependent Variable

Full sample:

Control & GODI:		Control & Palepu's:	
SIZE	-.1979**	SIZE	-.2047**
GLN	-.0611	UD	-.0971
GUD	-.0959	RD	-.0490
GRD	-.0402		
ΔR^2	.0724***	ΔR^2	.0724***
Palepu's:		GODI:	
UD	-.0809	GLN	-.0097
RD	-.1198	GUD	-.0139
		GRD	.0742
ΔR^2	.0008	ΔR^2	.0008
Total R^2	.0732**	Total R^2	.0732**

N	189
No. of outliers	5
Avg $\lvert z \rvert$ of outliers	4.4983

Sample without outliers:

Control & GODI:		Control & Palepu's:	
SIZE	-.2173**	SIZE	-.2039**
GLN	-.0348	UD	-.1096
GUD	-.1171	RD	-.0734
GRD	-.0423		
ΔR^2	.0822***	ΔR^2	.0816***
Palepu's:		GODI:	
UD	.0463	GLN	.0375
RD	-.3474	GUD	-.1486
		GRD	.3021
ΔR^2	.0083	ΔR^2	.0088
Total R^2	.0905***	Total R^2	.0905***

N 184

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* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.70 Comparison between GODI and Palepu's Measure by Hierarchical Regression Using Firm Performance (1988 SdROS) as Dependent Variable

Full sample:

Control & GODI:		Control & Palepu's:	
SIZE	-.0771	SIZE	-.1504*
GLN	-.1449*	UD	-.1656**
GUD	-.1683**	RD	.1418*
GRD	.0825		
ΔR^2	.0698***	ΔR^2	.0733***
Palepu's:		GODI:	
UD	-.0085	GLN	-.3433**
RD	.8244***	GUD	-.1908
		GRD	-.7309**
ΔR^2	.0411**	ΔR^2	.0377*
Total R^2	.1110***	Total R^2	.1110***

N	189
No. of outliers	6
Avg $\lvert z \rvert$ of outliers	4.4857

Sample without outliers:

Control & GODI:		Control & Palepu's:	
SIZE	.0796	SIZE	-.0192
GLN	-.2387***	UD	-.2361***
GUD	-.2483***	RD	.0413
GRD	-.0306		
ΔR^2	.0790***	ΔR^2	.0631***
Palepu's:		GODI:	
UD	.0648	GLN	-.4765***
RD	.8989***	GUD	-.3431
		GRD	-.9131***
ΔR^2	.0463**	ΔR^2	.0622***
Total R^2	.1253***	Total R^2	.1253***

N	183

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.71 Comparison between GODI and Palepu's Measure by Hierarchical Regression Using Firm Performance (1988 SG) as Dependent Variable

Full sample:

Control & GODI:		Control & Palepu's:	
SIZE	.0713	SIZE	.0703
GLN	-.0147	UD	-.0597
GUD	-.0691	RD	-.0400
GRD	-.0469		
ΔR^2	.0057	ΔR^2	.0043
Palepu's:		GODI:	
UD	.0857	GLN	-.0668
RD	.1169	GUD	-.1556
		GRD	-.1581
ΔR^2	.0008	ΔR^2	.0022
Total R^2	.0065	Total R^2	.0065

N	189
No. of outliers	4
Avg $\lvert z \rvert$ of outliers	5.1893

Sample without outliers:

Control & GODI:		Control & Palepu's:	
SIZE	.2076**	SIZE	.1954**
GLN	-.0405	UD	-.0892
GUD	-.1102	RD	-.0583
GRD	-.0742		
ΔR^2	.0312	ΔR^2	.0275
Palepu's:		GODI:	
UD	.2316	GLN	-.1594
RD	.2229	GUD	-.3405
		GRD	-.2855
ΔR^2	.0040	ΔR^2	.0077
Total R^2	.0352	Total R^2	.0352

N 185

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* p < .10
** p < .05
*** p < .01

Table 6.72 Comparison between GODI and Palepu's Measure by Hierarchical Regression Using Firm Performance (1988 PR) as Dependent Variable

Full sample:

Control & GODI:		Control & Palepu's:	
SIZE	-.1036	SIZE	-.0574
GLN	.1106	UD	-.0371
GUD	-.0265	RD	.0539
GRD	.0613		
ΔR^2	.0147	ΔR^2	.0068
Palepu's:		GODI:	
UD	-.1249	GLN	.1239
RD	.0844	GUD	.0901
		GRD	-.0281
ΔR^2	.0019	ΔR^2	.0099
Total R^2	.0166	Total R^2	.0166

N	189
No. of outliers	2
Cases without data	5
Avg $\lvert z \rvert$ of outliers	4.6410

Sample without outliers:

Control & GODI:		Control & Palepu's:	
SIZE	.0183	SIZE	.0418
GLN	.0525	UD	-.0273
GUD	-.0208	RD	.0027
GRD	.0018		
ΔR^2	.0045	ΔR^2	.0020
Palepu's:		GODI:	
UD	-.1057	GLN	.0596
RD	.0897	GUD	.0772
		GRD	-.0919
ΔR^2	.0016	ΔR^2	.0041
Total R^2	.0061	Total R^2	.0061

N 182

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* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.73 Comparison between GODI and Palepu's Measure by Hierarchical Regression Using Improvement in Firm Performance (ΔROA during 1984-88) as Dependent Variable

Full sample:

Control & GODI:		Control & Palepu's:	
ΔSIZE	.3185***	ΔSIZE	.3324***
ΔGLN	.1032	ΔUD	.1517*
ΔGUD	.1467*	ΔRD	.0716
ΔGRD	.0678		
ΔR^2	.1549***	ΔR^2	.1464***
Palepu's:		GODI:	
ΔUD	-.0924	ΔGLN	.1302
ΔRD	-.1124	ΔGUD	.2397
		ΔGRD	.1736
ΔR^2	.0011	ΔR^2	.0095
Total R^2	.1560***	Total R^2	.1560***

N	152
No. of outliers	6
Avg |z| of outliers	3.4050

Sample without outliers:

Control & GODI:		Control & Palepu's:	
ΔSIZE	.2194***	ΔSIZE	.2182***
ΔGLN	.1899**	ΔUD	.0343
ΔGUD	-.0314	ΔRD	.0084
ΔGRD	-.0339		
ΔR^2	.0853**	ΔR^2	.0485*
Palepu's:		GODI:	
ΔUD	.4545	ΔGLN	.1182
ΔRD	.1284	ΔGUD	-.4678
		ΔGRD	-.1407
ΔR^2	.0112	ΔR^2	.0479*
Total R^2	.0964**	Total R^2	.0964**

N 146

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.74 Comparison between GODI and Palepu's Measure by Hierarchical Regression Using Improvement in Firm Performance (ΔROS during 1984-88) as Dependent Variable

Full sample:

Control & GODI:		Control & Palepu's:	
ΔSIZE	-.0029	ΔSIZE	.0033
ΔGLN	.0547	ΔUD	.0802
ΔGUD	.0584	ΔRD	.0971
ΔGRD	.1162		
ΔR^2	.0149	ΔR^2	.0110
Palepu's:		GODI:	
ΔUD	.3753	ΔGLN	.0230
ΔRD	-.2015	ΔGUD	-.2845
		ΔGRD	.3233
ΔR^2	.0160	ΔR^2	.0198
Total R^2	.0308	Total R^2	.0308

N	152
No. of outliers	6
Avg |z| of outliers	4.1518

Sample without outliers:

Control & GODI:		Control & Palepu's:	
ΔSIZE	.0916	ΔSIZE	.1097
ΔGLN	.1744**	ΔUD	-.0108
ΔGUD	-.0845	ΔRD	-.0098
ΔGRD	-.0056		
ΔR^2	.0472	ΔR^2	.0117
Palepu's:		GODI:	
ΔUD	.5190	ΔGLN	.1397
ΔRD	-.3721	ΔGUD	-.5525
		ΔGRD	.3729
ΔR^2	.0374*	ΔR^2	.0729**
Total R^2	.0846*	Total R^2	.0846*

N 146

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.75 Comparison between GODI and Palepu's Measure by Hierarchical Regression Using Improvement in Firm Performance (ΔSdROA during 1984-88) as Dependent Variable

Full sample:

Control & GODI:		Control & Palepu's:	
ΔSIZE	-.3561***	ΔSIZE	-.3734***
ΔGLN	-.1099	ΔUD	-.2602***
ΔGUD	-.2671***	ΔRD	-.0968
ΔGRD	-.1030		
ΔR^2	.2399***	ΔR^2	.2266***
Palepu's:		GODI:	
ΔUD	.1735	ΔGLN	-.1619*
ΔRD	.2226	ΔGUD	-.4422
		ΔGRD	-.3128
ΔR^2	.0043	ΔR^2	.0175
Total R^2	.2441***	Total R^2	.2441***

N	152
No. of outliers	4
Avg |z| of outliers	4.5499

Sample without outliers:

Control & GODI:		Control & Palepu's:	
ΔSIZE	-.1926**	ΔSIZE	-.1969**
ΔGLN	-.1599**	ΔUD	-.1360
ΔGUD	-.1088	ΔRD	.0126
ΔGRD	.0329		
ΔR^2	.0722**	ΔR^2	.0563**
Palepu's:		GODI:	
ΔUD	-.0111	ΔGLN	-.1699
ΔRD	.1037	ΔGUD	-.1042
		ΔGRD	-.0682
ΔR^2	.0011	ΔR^2	.0219
Total R^2	.0782*	Total R^2	.0782*

N	148

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.76 Comparison between GODI and Palepu's Measure by Hierarchical Regression Using Improvement in Firm Performance (ΔSdROS during 1984-88) as Dependent Variable

Full sample:

Control & GODI:		Control & Palepu's:	
ΔSIZE	.0144	ΔSIZE	.0094
ΔGLN	-.0454	ΔUD	-.0938
ΔGUD	-.0725	ΔRD	-.0940
ΔGRD	-.1116		
ΔR^2	.0135	ΔR^2	.0117
Palepu's:		GODI:	
ΔUD	-.4023	ΔGLN	-.0061
ΔRD	.1711	ΔGUD	.2975
		ΔGRD	-.2901
ΔR^2	.0159	ΔR^2	.0177
Total R^2	.0294	Total R^2	.0294

N	152
No. of outliers	6
Avg |z| of outliers	4.2100

Sample without outliers:

Control & GODI:		Control & Palepu's:	
ΔSIZE	-.0702	ΔSIZE	-.0863
ΔGLN	-.1616*	ΔUD	-.0185
ΔGUD	.0579	ΔRD	.0215
ΔGRD	.0204		
ΔR^2	.0352	ΔR^2	.0084
Palepu's:		GODI:	
ΔUD	-.6109*	ΔGLN	-.1072
ΔRD	.3224	ΔGUD	.6148*
		ΔGRD	-.3134
ΔR^2	.0406*	ΔR^2	.0675**
Total R^2	.0759*	Total R^2	.0759*

N 146

* p < .10
** p < .05
*** p < .01

Table 6.77 Comparison between GODI and Palepu's Measure by Hierarchical Regression Using Improvement in Firm Performance (ΔSG during 1984-88) as Dependent Variable

Full sample:

Control & GODI:		Control & Palepu's:	
ΔSIZE	.0944	ΔSIZE	.1011
ΔGLN	.0093	ΔUD	.0268
ΔGUD	.0545	ΔRD	-.0471
ΔGRD	-.0320		
ΔR^2	.0150	ΔR^2	.0134
Palepu's:		GODI:	
ΔUD	-.4744	ΔGLN	.1084
ΔRD	-.2445	ΔGUD	.5142
		ΔGRD	.1893
ΔR^2	.0134	ΔR^2	.0151
Total R^2	.0284	Total R^2	.0284

N	152
No. of outliers	5
Avg $\lvert z \rvert$ of outliers	4.1236

Sample without outliers:

Control & GODI:		Control & Palepu's:	
ΔSIZE	.3174***	ΔSIZE	.3341***
ΔGLN	.0899	ΔUD	-.0602
ΔGUD	-.0801	ΔRD	-.1643*
ΔGRD	-.1826**		
ΔR^2	.1302***	ΔR^2	.1155***
Palepu's:		GODI:	
ΔUD	-.2444	ΔGLN	.1353
ΔRD	-.0703	ΔGUD	.1539
		ΔGRD	-.1209
ΔR^2	.0034	ΔR^2	.0181
Total R^2	.1336***	Total R^2	.1336***

N 147

* $p < .10$
** $p < .05$
*** $p < .01$

Table 6.78 Comparison between GODI and Palepu's Measure by Hierarchical Regression Using Improvement in Firm Performance (ΔPR during 1984-88) as Dependent Variable

Full sample:

Control & GODI:		Control & Palepu's:	
ΔSIZE	-.2273***	ΔSIZE	-.2294***
ΔGLN	-.0568	ΔUD	-.0278
ΔGUD	-.0238	ΔRD	-.0005
ΔGRD	-.0116		
ΔR^2	.0563*	ΔR^2	.0534*
Palepu's:		GODI:	
ΔUD	.0377	ΔGLN	-.0869
ΔRD	.2202	ΔGUD	-.0720
		ΔGRD	-.2234
ΔR^2	.0041	ΔR^2	.0070
Total R^2	.0604	Total R^2	.0604

N	152
No. of outliers	6
Cases without data	8
Avg |z| of outliers	3.0171

Sample without outliers:

Control & GODI:		Control & Palepu's:	
ΔSIZE	-.2190**	ΔSIZE	-.2211***
ΔGLN	-.0007	ΔUD	.0733
ΔGUD	.0647	ΔRD	.0493
ΔGRD	.0099		
ΔR^2	.0511	ΔR^2	.0523*
Palepu's:		GODI:	
ΔUD	.1220	ΔGLN	-.0589
ΔRD	.4174	ΔGUD	-.0719
		ΔGRD	-.3891
ΔR^2	.0139	ΔR^2	.0127
Total R^2	.0650	Total R^2	.0650

N 138

* $p < .10$
** $p < .05$
*** $p < .01$

Sample without outliers. Using the sample without outliers, the cross-sectional analyses, however, show that Palepu's measure explained more residual variance than GODI only in terms of ROA in 1984 (Table 6.61). But GODI explained more residual variance than Palepu's measure in terms of ROS and SdROS in 1988 (Tables 6.68 and 6.70). Moreover, as seen in Tables 6.73 to 6.78, the dynamic analyses show that GODI explained more residual variance than Palepu's measure in terms of ΔROA (Table 6.73), ΔROS (Table 6.74) and ΔSdROS (Table 6.76). This indicates that GODI was able to explain more variance than Palepu's measure in terms of profitability and its stability in dynamic analyses.

Summary of comparisons of diversification measures:

The results of the full sample suggest that GODI is not better than either Kim's or Palepu's measure in explaining the residual variance in any performance measure. Therefore, Hypotheses 9a to 12d are rejected.

Similarly, using the sample without outliers, the data of the years 1984 and 1988 did not show any consistent difference between GODI and other two measures. This indicates that Hypotheses 9a to 9d and Hypotheses 10a to 10d are rejected.

However, the sample without outliers show that GODI was somewhat superior to Kim's global diversification measure and Palepu's diversification measure in explaining the variance in the improvement in firm performance during 1984-1988. This indicates that GODI is a better measure than other two measures in dealing with the dynamic impact of diversification on firm performance. Concerning the hypothesis testing, Hypotheses 11a, 11b, 12a and 12b are supported while Hypotheses 11c, 11d, 12c, and 12d are rejected.

CHAPTER 7 DISCUSSION

The results of this study are summarized in Tables 7.1 to 7.3. Table 7.1 presents the global diversification components and the performance measures they significantly influenced from both cross-sectional and dynamic perspectives. Table 7.2 shows the results of the comparisons between different diversification measures by identifying the performance measures in which a diversification measure was superior to another measure. Finally, Table 7.3 shows the summary of the tests of hypotheses of this study.

In general, the results suggest that firm performance was influenced by global diversification. But, such the influence did not extend to all performance measures consistently. Firm performance is multi-faceted and it is not terribly surprising to find that some measures are not influenced by global diversification.

In the following sections, the results of this study will be discussed.

Table 7.1 Summary of Hierarchical Regression Results

A. Cross-sectional analyses of 1984 data

Strategy Variable	Performance Measure Influenced: Full sample	Sample without outliers
GLN	ROS, SdROS	ROS, SdROS, SG
GUD	SdROA, SdROS	SdROA, SdROS
GRD	-	SG
GLNxGUD	-	SdROA
GLNxGRD	-	SdROA
GUDxGRD	-	-
GLNxGUDxGRD	-	-

B. Cross-sectional analyses of 1988 data

Strategy Variable	Performance Measure Influenced: Full sample	Sample without outliers
GLN	ROS, SdROS	ROS, SdROS
GUD	ROS, SdROS	ROS, SdROS
GRD	-	-
GLNxGUD	-	ROS, SdROS
GLNxGRD	-	-
GUDxGRD	-	-
GLNxGUDxGRD	-	ROS, SdROS, SG

C. Dynamic analyses of 1984-88 data

Strategy Variable	Performance Measure Influenced: Full sample	Sample without outliers
ΔGLN	-	ΔROA, ΔSdROA
ΔGUD	ΔSdROA	-
ΔGRD	-	ΔSG
ΔGLNxΔGUD	ΔSdROA	ΔROA, ΔSG
ΔGLNxΔGRD	ΔSG	ΔSG
ΔGUDxΔGRD	ΔSdROA, ΔSG	-
ΔGLNxΔGUDxΔGRD	-	ΔROA, ΔROS, ΔSdROS

Table 7.1 (cont.)

D. Dynamic analyses (1984-88 data) of diversification in the triad region

Strategy Variable	Performance Measure Influenced: Full sample	Performance Measure Influenced: Sample without outliers
ΔGLNtr	ΔSG	ΔSG
ΔGUDtr	ΔSdROA	-
ΔGRDtr	-	-
ΔGLNtrxΔGUDtr	ΔSG	ΔSdROA, ΔSG
ΔGLNtrxΔGRDtr	ΔSG	ΔSG
ΔGUDtrxΔGRDtr	-	-
ΔGLNtrxΔGUDtrxΔGRDtr	-	-

E. Dynamic analyses (1984-88 data) of diversification in non-triad countries

Strategy Variable	Performance Measure Influenced: Full sample	Performance Measure Influenced: Sample without outliers
ΔGDnt	ΔROA, ΔSdROA	ΔROA, ΔSdROA, ΔSG

Table 7.2 Summary of Comparisons between GODI and Kim's Global Diversification Measure and Palepu's Diversification Measure

Comparison	Performance Measure: Full sample	Performance Measure: Sample without outliers
GODI vs Kim's:		
GODI is superior	-	ΔROA, ΔROS, ΔSdROS
Kim's is superior	-	-
GODI vs Palepu's:		
GODI is superior	-	ROS(88), SdROS(88), ΔROA, ΔROS, ΔSdROS
Palepu's is superior	ROA(84), SdROS(88)	-

Table 7.3 Summary of Tests of Hypotheses

A. All firms:

Hypothesis	Dependent Variable	Interactions	Result (Full sample)	Result (Sample without oultiers)
1a	ROA,ROS	No	Weakly supported	Weakly supported
1b	SdROA,SdROS	No	Supported	Supported
1c	SG	No	Rejected	Rejected
1d	PR	No	Rejected	Rejected
2a	ROA,ROS	Yes	Rejected	Rejected
2b	SdROA,SdROS	Yes	Rejected	Rejected
2c	SG	Yes	Rejected	Rejected
2d	PR	Yes	Rejected	Rejected
3a	ΔROA,ΔROS	No	Rejected	Supported*
3b	ΔSdROA,ΔSdROS	No	Supported	Supported
3c	ΔSG	No	Rejected	Rejected
3d	ΔPR	No	Rejected	Rejected
4a	ΔROA,ΔROS	Yes	Rejected	Partially supported*
4b	ΔSdROA,ΔSdROS	Yes	Partially supported	Partially supported
4c	ΔSG	Yes	Supported	Supported
4d	ΔPR	Yes	Rejected	Rejected

* The results of the hypothesis test changed after outliers were removed from the analysis.

Table 7.3 (cont.)

B. Firms in high-tech industries:

Hypothesis	Dependent Variable	Interactions	Result (Full sample)	Result (Sample without oultiers)
5a	ΔROA, ΔROS	No	Rejected	Rejected
5b	ΔSdROA, ΔSdROS	No	Supported	Rejected*
5c	ΔSG	No	Supported	Supported
5d	ΔPR	No	Rejected	Rejected
6a	ΔROA, ΔROS	Yes	Rejected	Rejected
6b	ΔSdROA, ΔSdROS	Yes	Rejected	Supported*
6c	ΔSG	Yes	Supported	Supported
6d	ΔPR	Yes	Rejected	Rejected

C. Firms in low-tech industries:

Hypothesis	Dependent Variable	Interactions	Result (Full sample)	Result (Sample without oultiers)
7a'	ΔROA, ΔROS	No	Supported	Supported
7b'	ΔSdROA, ΔSdROS	No	Supported	Supported
7c'	ΔSG	No	Rejected	Supported*
7d'	ΔPR	No	Rejected	Rejected
8a-8d			Not tested	

* The results of the hypothesis test changed after outliers were removed from the analysis.

Table 7.3 (cont.)

D. GODI vs Kim's measure:

Hypothesis	Dependent Variable	Interactions	Result (Full sample)	Result (Sample without oultiers)
9a	ROA,ROS	No	Rejected	Rejected
9b	SdROA,SdROS	No	Rejected	Rejected
9c	SG	No	Rejected	Rejected
9d	PR	No	Rejected	Rejected
11a	ΔROA,ΔROS	No	Rejected	Supported*
11b	ΔSdROA,ΔSdROS	No	Rejected	Supported*
11c	ΔSG	No	Rejected	Rejected
11d	ΔPR	No	Rejected	Rejected

E. GODI vs Palepu's measure:

Hypothesis	Dependent Variable	Interactions	Result (Full sample)	Result (Sample without oultiers)
10a	ROA,ROS	No	Rejected	Rejected
10b	SdROA,SdROS	No	Rejected	Rejected
10c	SG	No	Rejected	Rejected
10d	PR	No	Rejected	Rejected
12a	ΔROA,ΔROS	No	Rejected	Supported*
12b	ΔSdROA,ΔSdROS	No	Rejected	Supported*
12c	ΔSG	No	Rejected	Rejected
12d	ΔPR	No	Rejected	Rejected

* The results of the hypothesis test changed after outliers were removed from the analysis.

Influence of Outliers

Outliers were found in most regression analyses of this study. In general, they caused a violation of normality of the error term distribution. Some conventional transformation techniques (e.g., log and square root) were considered to tackle such a violation. However, these techniques were deemed to be inappropriate for this study.

As revealed by the plots of standardized residuals (e.g., the plot shown in Figure 6.1), outliers identified in regression analyses of this study were cases far apart from the majority of the data. These cases were believed to be extreme and unusual to the sample being investigated. Therefore, they were discarded. The results of both the full sample and the sample without outliers are provided.

Tables 7.1 and 7.2 show that the results of the full sample were different from that of the sample without outliers. In general, more significant results were found in the sample without outliers than the full sample. Concerning the hypothesis testing, the results of nine out of forty-four tested hypotheses had changed when the sample without outliers was used instead of the full sample (Table 7.3). Eight had changed from rejected to supported and one had changed from supported to rejected. This further illustrates that outliers were influential on the results of this study. These outlying cases might have their own unique characteristics which did not cause a systematic influence on the data in general. Inclusion of these outliers in analysis might disguise the relationship between global diversification and firm performance.

Some recently developed transformation techniques can be considered in the future study, for example, robust regression analysis (Chatterjee & Wiseman, 1985). Robust regression basically assigns different weights to different cases with respect to their residuals. The greater the residual a case has, the less weight it will receive. That means, for cases far away from the majority of the data, the weights they will receive will be close to zero. In that sense, the difference between the results of robust regression and that of ordinary regression without outliers should not be significantly large.

Robust regression was not used in this study because: (1) most outliers were far away from the majority of the data, robust regression was not expected to generate a result dramatically different from ordinary regression without outliers; and (2) ordinary regression without outliers is much simpler than robust regression in application unless the former cannot be properly justified.

However, the use of different techniques concerning outliers may provide more information about the influence of outliers on the topic being studied.

Cross-Sectional Perspective vs Dynamic Perspective

The cross-sectional results show that global diversification had no consistent significant impact ($p < 0.05$) on profitability measures and sales growth. This may indicate that firms using different global diversification strategies have similar levels of performance, or firms using the same global diversification strategies have different levels of performance.

The equifinality in performance may be due to differences in environment. Firms using strategies that fit their environment may outperform those with a strategy-environment misfit and more (or less) global diversification is not automatically a superior strategic option.

Still, one may argue that global diversification is a sound response to an increasingly global environment. Involvement in global diversification may indicate an awareness of this changing environment. Firms with such awareness might be expected to outperform others without it. However, this viewpoint was not fully substantiated by the results of this study. Perhaps the management of firms with the early awareness of global competition are unable to handle the new strategy or have not yet developed an organization capable of dealing with the increased complexities of global competition. As Chandler (1962) suggested, structure must follow strategy; firms that have not yet designed an organization suited to a global strategy may not achieve its full performance benefits. It could well be that this problem of fit is why the superiority of global diversification strategies did not receive the strong empirical support we expected.

Nevertheless, the dynamic relationship between global diversification and firm performance appeared to be both different and stronger than the cross-sectional perspective. The results show that changes in performance measures, except stock market performance, were influenced by changes in global diversification. This indicates that a firm's performance is affected by changing its global diversification strategy. Moreover, the effect is a function of a combination of components.

The cross-sectional perspective and the dynamic perspective are two different ways to examine the relationship between global diversification and firm performance. The cross-sectional perspective only considers the relationship at a particular point in time. For example, a positive relationship between globalization (GLN) and ROS means that a firm which is high in globalization would be also high in ROS at that particular point in time. But another question is whether a firm can improve its performance by changing its global diversification strategy over time? That is the dynamic perspective of the relationship.

The conventional wisdom would agree that if high GLN leads to high ROS, increase in globalization would lead to increase in ROS. However, this study shows that such an implication may be wrong. The cross-sectional results show that global diversification had no significant impact on profitability measures and sales growth at the 0.05 level. If not carried further, this might lead to the conclusion that the degree of global diversification of a firm does not affect its profitability and sales growth. However, the dynamic analysis shows that the change in global diversification had a significant impact on changes in firm performance, except with respect to PR. This indicates that changes in global diversification does lead to changes in firm performance. Managers may alter the degree of global diversification of their firms in order to improve the firm performance.

Table 7.4 illustrates, through an example, the inconsistencies between the cross-sectional perspective and the dynamic perspective in the relationship of global diversification and firm performance. Unlike the lack of linear relationships between global diversification and performance for both 1984 and 1988, the change between 1984 and 1988 shows a perfect linear relationship. This points out that the dynamic perspective is not an extension of the cross-sectional perspective. This also explains the variance in recent research results. For example, Geringer et al. (1989) found that internationalization is positively related to profitability, but Mirchandani and Lee (1991) found the opposite. The cross-sectional design of their research might be one of the reasons for such an inconsistency.

The inconsistency between results from the cross-sectional perspective and the dynamic perspective also shows the limitations of using cross-sectional data for global diversification research. From the cross-sectional results of this study, one may conclude that global

Table 7.4 Illustration of Possible Inconsistency between the Cross-Sectional Perspective and Dynamic Perspective in the Relationship between Global Diversification (GD) and Firm Performance (FP)

Firm	1984		1988		1984-88	
Number	GD	FP	GD	FP	ΔGD	ΔFP
1	2	3	3	4	1	1
2	3	5	5	7	2	2
3	4	2	7	5	3	3
4	5	4	9	8	4	4

diversification has limited impact on firm performance. This conclusion is biased because the dynamic perspective shows that a firm can indeed improve its performance through changing its global diversification strategy. Therefore, cross-sectional results may be misleading in the examination of the relationship between global diversification and firm performance. This suggests that the interpretation of cross-sectional results should be done with caution.

Global Diversification Components Are Interactive, Not Independent

Global diversification is a complex phenomenon and its impact on firm performance reflected this complexity in that the individual global diversification components were not as effective in explaining performance as the interactions of these components. This was particularly true for the dynamic impact of global diversification on firm performance. This indicates that the importance of global diversification strategy is not reflected by merely examining one component or another, but rather a combination of components.

Nevertheless, except for the relationship between ΔGRD and ΔSG, all significant main effects found agreed with the hypotheses. However, all main effects in the dynamic perspective of the analysis were included in the interaction effects and these interactions provided a more complete understanding of the relationship between global diversification and firm performance. For example, the unexpected relationship between ΔGRD and ΔSG was explained and reconciled by examining the concerned interaction term.

Stabilization of Profitability

Globalization (GLN) and global unrelated diversification (GUD) had a consistent positive impact on the stability of profitability. The results are compatible with past research that globalization and unrelated diversification can stabilize profitability (Kim et al, 1989; Miller & Pras, 1980).

Also, the stability effect of global unrelated diversification (GUD) was greater than globalization (GLN) in most cases. This may be due to the narrowing gap between the technological development between countries (Davidson & Harrigan, 1977) and the increasing homogeneity in products and fluid communications around the world, particularly among countries in the triad region (Ohmae, 1990). The speed with which a product or an idea can be transferred from its originating country to another country is becoming increasingly important. This would weaken the possible advantage of the international life cycle which suggests that firms may extend the life of their established technology through transferring it or selling products to less developed countries (Vernon, 1966). That means multinationality may not bring in as much profit as before. Therefore, it is not terribly surprising that globalization is less effective than unrelated diversification in diversifying risk or in stabilizing profitability.

From the dynamic perspective, firms pursuing the global diversification through either global unrelated diversification, global related diversification performed well in stabilizing their profitability. But firms increasing globalization and decreasing or keeping a stable diversification level (H-ΔGLN, L-ΔGUD, L-ΔGRD) were poor in stabilizing their profitability. These firms tend to have a more specialized operations and tend to extend their specialized business overseas. As the world markets are more homogeneous than before (Ohmae, 1990), these firms cannot obtain much diversification benefit from globalization.

In contrast to domestic unrelated diversifiers, firms that did not increase their global diversification (L-ΔGLN, L-ΔGUD, L-ΔGRD) were more stable in ROS. These firms tended to retrench from global diversifications, and refocus on specialized domestic operations. Focusing on a narrower niche of customers may help improve the stability in ROS by providing better market forecasts.

Stock Market Performance

Global diversification had no significant impact on stock market measures in either the cross-sectional or dynamic analyses. Perhaps stock market measures are more affected by the expectation of investors, and less influenced by corporate strategy than accounting measures. Expectations are always based on the quality of a strategy, i.e., how a firm matches resources and skills with opportunities and threats in the environment, not just the type of strategy. However, the quality of strategy was not studied in this research. Whether the quality of strategy moderates the relationship between global diversification and stock market performance is a question that should be examined in future studies.

Another explanation for the insignificant relationship between global diversification and stock market performance is that global diversification may influence the stock market performance of some firms in some industries, but not for all firms in any industry and not for all industries.

Best Dynamic Global Diversification Strategies

Table 7.5 summarizes the impact of the change in global diversification on the change in firm performance. Table 7.5 only reported the interaction effects because all main effects were included in the interaction effects.

In Table 7.5, the performance of each interaction was ranked by putting "1" for the best, "2" for the second best, and so on. The poorest was ranked "4" in two-way interaction because there were only four different combinations. Similarly, the poorest of the three-way interaction was ranked "8" because there were eight different combinations.

The three best strategies in terms of ΔROA, ΔROS and the stability of ROS are "H-ΔGLN, H-ΔGUD, L-ΔGRD", "H-

Table 7.5 Summary of the Impact of Interactions of Global Diversification Components on Firm Performance from the Dynamic Perspective

Interaction	ΔROA	ΔROS	ΔSdROS	ΔSG
ΔGLNxΔGUD:				
H-H	2			3
H-L	1			1
L-H	4			4
L-L	3			2
ΔGLNxΔGRD:				
H-H				2
H-L				3
L-H				4
L-L				1
ΔGUDxΔGRD:				
H-H				
H-L				
L-H				
L-L				
ΔGLNxΔGUDxΔGRD:				
H-H-H	5	5	5	
H-H-L	2	4	3	
H-L-H	1	2	1	
H-L-L	4	3	8	
L-H-H	8	8	7	
L-H-L	6	7	4	
L-L-H	7	6	6	
L-L-L	3	1	2	

ΔGLN, L-ΔGUD, H-ΔGRD" or "L-ΔGLN, L-ΔGUD, L-ΔGRD." This indicates that firms increasing either global unrelated diversification or global related diversification and firms decreasing or keeping global diversification stable, outperform firms using mixed global diversification strategies or domestic diversification strategies. Firms increasing in global diversification may reap the advantages of global operations such as operation efficiency and international financial arbitrage. On the other hand, firms ceasing or decreasing their global diversification to refocus their operations to already established businesses, may be more sensitive to the demand of the market and customers, as well as their performance.

The scores also indicate that using a mix of global diversification strategies like those increasing both global unrelated diversification and global related diversification (H-ΔGLN, H-ΔGUD, H-ΔGRD) or increasing globalization and decreasing or keeping a stable global diversification (H-ΔGLN, L-ΔGUD, L-ΔGRD) leads to relatively poorer performance. This finding seems to echo Porter's (1980) argument that firms should compete with one single strategy, not a mix of strategies.

Adopting Porter's (1980) concept of generic strategies to global diversification strategies, the results of this study would suggest that firms using single-direction global diversification strategies may outperform others in global competition. These strategies include globalizing through unrelated diversification (H-ΔGLN, H-ΔGUD, L-ΔGRD), globalizing through related diversification (H-ΔGLN, L-ΔGUD, H-ΔGRD), and making few changes in global diversification (L-ΔGLN, L-ΔGUD, L-ΔGRD).

Global Diversification of Firms in High-Tech Industries

The results show that firms in high-tech industries diversifying their assets in the triad region should improve their sales growth and the stability of ROA, but not their profitability. The stability effect of GLN and GUD is the same as discussed before. The major difference between the general data and the firms in high-tech industries is the effect of global diversification strategies on ΔSG. In contrast to the findings from the general data, firms in high-tech industries increasing in GRD in the triad region may gain a competitive edge in global markets that enhances their sales growth.

The relationship between the change in diversification in the triad region and the change in profitability may indicate that those firms are more interested in sales growth than profitability. They may be willing to sacrifice increases in profitability for expansion in sales in order to finance research and development expenses.

The strategies of diversification in the triad region were ranked by the approach used in last section. Table 7.6 shows the rank order of these eight strategies. The strategies were ranked with respect to ΔSG and the improvement in the stability of ROA only rather than all of the five performance measures used in last section because no significant findings were obtained for ΔROA, ΔROS, and ΔSdROS. While not as comprehensive, these ranking do provide some insights on the most effective global strategies for high-tech corporations in the triad region.

As seen in Table 7.6, on average, firms that increase the deployment of assets in the triad region improve their performance more than those that use other strategies. This indicates that in the competition among firms in high-tech industries, strategies of globalizing into the triad region should outperform other strategies, including

Table 7.6 Summary of the Impact of Interactions of Global Diversification Components with respect to Diversification in the Triad Region on Firm Performance from the Dynamic Perspective

Interaction	ΔSG	ΔSdROA
ΔGLNtrxΔGUDtr:		
H-H	2	1
H-L	1	3
L-H	3	2
L-L	4	4
ΔGLNtrxΔGRDtr:		
H-H	1	
H-L	3	
L-H	4	
L-L	2	

the retrenching strategy which is one of the best strategies found in the general data.

Global Diversification of Firms in Low-Tech Industries

The focus of global diversification of firms in low-tech industries was on the impact on the change in firm performance from the change in the diversification of those firms' assets into non-triad countries. The analysis was different from the analyses that preceded it. Only one global diversification strategy factor, which was formed by factor analyzing all three global diversification components, was used in the analysis because all three components were highly correlated with one another. Also, all factor coefficients were positive. This suggests that if firms in low-tech industries increase their diversification into non-triad countries, they would increase in both global unrelated diversification and global related diversification. Once experience is gained in operating in non-triad regions, it appears that low-tech firms should continue to exploit the low factor costs from those countries regardless of the relatedness of the diversified operations.

The findings are consistent with the hypothesis which indicates that firms in low-tech industries should benefit from diversifying in non-triad regions. The gain may be due to the comparative advantages among non-triad nations such as cheap labor costs (Kogut, 1985). Such advantages might influence a firm's ROA (i.e. a measure of the efficiency of the use of assets) and ROA related measures (e.g., SdROA) because lower costs lead to greater returns. Moreover, lower costs allow lower prices and, hence, may stimulate sales growth.

However, as discussed earlier, PR is probably not an appropriate measure of investors' complicated responses and ROS is of a different nature from ROA. Those may be the reasons that there was no relationship between ΔGDnt and ΔPR, ΔROS and ΔSdROS.

Measurement of Global Diversification

GODI is a newly developed measure of global diversification. This is the first time it has been used in an empirical study. Evidently, GODI is a useful measure for testing hypotheses or global diversification. Moreover, GODI was compared with other diversification measures and found to be superior in measuring the dynamic impact of global diversification on performance.

GODI was compared with Kim's global diversification measure and Palepu's diversification measure by means of usefulness analysis. All three measures are based on the entropy approach. The major difference between these three measures is the orientation. GODI is a geographic-oriented global diversification measure, Kim's measure is a product-oriented global diversification measure and Palepu's measure is a measure of product diversification only.

The analysis of cross-sectional data showed that there was no consistent difference between GODI and the other two measures in terms of the cross-sectional analysis. From the dynamic perspective, however, the results show that GODI is a better measure than other two measures in explaining the change in firm performance. This indicates that geographic orientation is better than product orientation in studying the relationship between the changes in global diversification and firm performance. Product diversification is not sufficient to explain the impact of the change in diversification on the change in firm performance. The consideration of geographic dispersion is recommended.

Size Effect

A size effect was found in most significant regression analyses in this study. This indicates that firm size has a significant impact on firm performance. Larger firms perform better. The superior performance of large firms may come from economies and synergies in both operational and financial arrangements. Thus, economies of scale in manufacturing, research and development activities, distribution channels, advertising and customer services, internal financing, credits from outside financial institutions, negotiation capability with governments, and so on increase with size. On the other hand, larger size may incur higher administrative costs and/or more bureaucracy in organization that would reduce the efficiency and effectiveness of the firm. However, this phenomenon was not verified in this study.

It would seem that larger firms should be more eager to diversify across borders because they need a bigger market for their operations. In fact, larger firms are better equipped to raise capital for their overseas investments. Moreover, when a firm has experienced the advantage of operating globally, it is better positioned for further expansion of its global operations, as a consequence, grows even larger. It is possible that a firm growing in size and global diversification can attain a high level of performance. Nevertheless, in this study, firm size was only considered as a control variable and the impact of its interaction with global diversification on firm performance was not explored. This, however, is a question that deserves consideration in future studies.

Threshold of Global Diversification

Some studies indicate that there is threshold in the relationship between global diversification and firm performance (Geringer et al., 1989; Hitt et al., 1991). That means the relationship between the degree of global diversification and firm performance would remain positive until the degree of global diversification exceeds the threshold, then the relationship becomes negative or levels off. However, the results of this study do not agree with the threshold hypothesis. The measurement of diversification used in this study may be the major cause of the inconsistency. As shown below, the entropy measure is a weighted measure by including the natural logarithm of the reciprocal of the proportion as the weight to the proportion required for the computation of the score of the measure.

$$S = \sum_{i=1}^{n} p_i \ln(1/p_i) \qquad (7.1)$$

where S is the score of the measure, P_i is the proportion of concern, and $\ln(1/p_i)$ is the weight.

The characteristic of entropy measure is that the weight of the measure suppresses the magnitude of the measure as $(1/p_i)$ increases. As shown in Figure 7.1, the high end of the entropy measure (l_2) levels off rather than going straight up linearly as found in the unweighted measure (l_1). The difference between two different degrees of global diversification at the high end of the scale is less different in the entropy approach than in the unweighted approach. Therefore, the possible existence of threshold in the relationship between global diversification and firm performance cannot be easily detected by the entropy measure and must be further explored using alternative measurement methods.

Implications for Future Research

Although a number of issues has been hypothesized, tested and discussed in this study, more issues have yet to be investigated. In the analysis, the dichotomization

For the unweighted measure:

$$l_1: \quad S = n \tag{7.2}$$

For the entropy measure:

$$l_2: \quad S = \sum_{i=1}^{n} p_i \ln(1/p_i) \tag{7.3}$$

Where S = Score of the measure
n = number of subjects of concern (e.g., number of different industries)
p_i = proportion of subject i

For the convenience of comparison, assume

$$p_i = 1/n \tag{7.4}$$

The graphical representation of l_1 and l_2 is as follows:

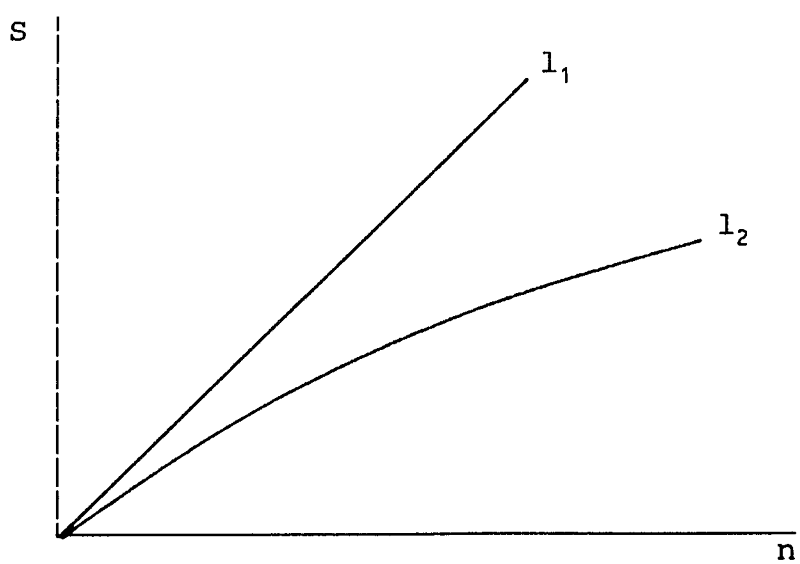

Figure 7.1 Comparison between Unweighted Measure and Entropy Measure

of data revealed that different categories of global diversification strategies may lead to different levels of performance. But categorization of global diversification strategies has not been fully explored. A classification of global diversification from the dynamic perspective is constructive to further understanding of the characteristics and performance of different global diversification strategies. This does not downgrade the contribution of using continuous measures for research on strategy, but highlights that categorization of global diversification strategies would help explore the meaning of different strategies in different circumstances.

The results show that firms in industries with different levels of technological sophistication had different behaviors in global diversification. Firms in high-tech industries tend to acquire competitive advantage through increasing in diversification into the triad region. On the other hand, firms in low-tech industries tend to extract comparative advantage through increasing diversification into non-triad countries. This indicates that firms from different industries would pursue different global diversification strategies. Industry-based research on global diversification is definitely fruitful in the future.

Surprisingly, firm size has been considered as a control variable for strategy research for a long time, but its interaction with global diversification strategy has never been examined. The interaction of firm size and global diversification strategies would improve our understanding of the relationship between global diversification strategies and firm performance. This would also help managers to choose a global diversification strategy relevant to the size of their firms.

Implications for Management Practice

Encountering increasingly global environment, one of the most common questions managers always ask is what they should change. This study seeks to respond to this inquiry by providing insights with respect to global diversification strategies.

The results show that changes in global diversification are positively related to changes in all accounting performance measures used in this study, including profitability and its stability and sales growth. That means a firm may improve its performance by increasing global diversification. Interestingly, when the interactions between global diversification components were examined, not all strategies that involve decreasing or keeping a stable globalization (L-ΔGLN) lead to inferior performance. Firms decreasing or keeping global diversification stable (L-ΔGLN, L-ΔGUD, L-ΔGRD) do not perform worse than firms following other global strategies.

In general, this study shows that firms increasing globalization in either unrelated or related diversification and firms decreasing or keeping the extent of their global diversification stable perform better than those using other diversification strategies. This suggests that managers may improve firm performance by pursuing any of these global diversification strategies.

Moreover, analyses of firms in high-tech and low-tech industries provide some detailed information about global diversification strategies with respect to different levels of industry technological intensity. The results suggest that firms in high-tech industries may increase their sales growth and the stability of profitability by increasing global diversification in the triad region. Particularly, increasing global related diversification in the triad region helps improve sales growth.

On the other hand, firms in low-tech industries may improve performance by diversifying into non-triad regions.

The comparison of different measures of diversification shows that the measure with geographic concern explains more variance in firm performance than other measures in dynamic analyses. This suggests that the measure developed in this study, i.e., GODI, may provide managers a tool for examining the diversification strategies of their firms as well as their relationship with firm performance.

Finally, it is noted that management is crucial to the success of diversification strategy (Ramanujam & Varadarajan, 1989). Managers should be constantly seek to develop better management skills for coping with the strategy selected to compete in this increasingly global environment.

CHAPTER 8 CONCLUSION

This study was concerned with the relationship between global diversification and firm performance, particularly from the dynamic perspective. It was hypothesized that changes in global diversification have an impact on changes in firm performance. The data was also cross-sectionally analyzed in order to examine how global diversification is related to firm performance at different points in time. The cross-sectional analysis shows that global diversification had only a weak impact on ROS and some influence on the stability of profitability. However, the dynamic analysis shows that changes in global diversification had a significant impact on changes in all accounting performance measures. Global diversification had no significant impact on stock market measures in either the static or dynamic analyses.

This indicates that the dynamic perspective is not merely an extension of the cross-sectional perspective. Attempts to postulate any dynamic relationship with inference from cross-sectional results should be done with caution.

The results also suggest that the global diversification components are interactive rather than independent. This indicates that a deliberate categorization of global diversification strategies would enhance the understanding of the relationship between global diversification and firm performance. For example, cluster analysis with respect to the components of global diversification might be useful.

Ohmae's (1985) assertion that technology-oriented firms tend to enter the triad region (Western Europe, North America and Japan) for technological advantage and market enlargement is only partially supported in this study. The results show that firms which were primarily operating in high-tech industries could improve the stability of profitability by increasing global diversification in the triad region, but not other performance measures. On the other hand, firms which were primarily operating in low-tech industries could improve a variety of performance measures through increasing in global diversification in non-triad countries.

This study also provided a test for the feasibility of a new entropy measure of global diversification which is named the Geographic-Oriented Diversification Index (GODI). From the cross-sectional analysis, there was no difference between GODI and Kim's global diversification measure but Palepu's diversification measure was superior to GODI in a couple of performance measures. However, from the dynamic analysis, GODI was superior to the other two measures in dealing with the relationship between global diversification and firm performance. This indicates that the geographic orientation is better than product orientation in explaining the impact of diversification on firm performance from the dynamic perspective.

Some limitations exist in this study. First, the measurement of global diversification was based on estimates of the breakdowns of firm assets across industries and countries according to the information available on Dun & Bradstreet's publications and company annual reports on NAARS database. The reason for using estimates was that the true breakdowns of firm assets had never been publicly disclosed. Other research approaches, for examples, case studies, interviews or mail surveys, may improve our understanding of the accuracy of the estimates used in this study as well as their application to future research.

Second, the sample of this study is a convenience sample of COMPUSTAT firms primarily operating in seven U.S. manufacturing industries with information available on global diversification for the years 1984 and 1988. It would be a concern that results from data of different time periods may be different because the performance of global diversification may be affected by temporal factors such as the economic conditions and the investment environments in both home country and foreign countries. For example, the 1980s was a period of prosperity. Firms expanding globally during that period might improve their performance more than others. Whether firms achieve the same level of performance in another period of time requires further investigation. Moreover, these firms are from seven U.S. manufacturing industries only. The results of this study may only apply to the sample being studied, hindering the generalization of the results to samples from different time periods and/or from different countries. Results from data of different industries (e.g., service industries) or data of non-U.S. based firms may be different from this study because different industries have their own competitive environments and firms in different countries may have different strategic orientations in global diversification. Future studies using samples from different time periods, industries, and/or countries would enhance the understanding of the relationship between global diversification and firm performance.

Third, the focus of this study was on the content side of strategic management rather than the process side. Several research questions which are related to the process side of strategy may affect the results of this study. For instance, how can a firm successfully manage its global diversification strategy? In addition, more attention should be paid to the influence of some other possible moderators on the relationship between global diversification and firm performance such as choice of entry mode (Kim & Hwang, 1992), relations between the firm and the government of the host country (Brewer, 1992), coordination and management (Martinez & Jarillo, 1989; Ramanujam & Varadarajan, 1989), fit between strategy and structure (Brown, 1989; Habib & Victor, 1991) and organizational alignment with environment (Powell, 1992). The consideration of these moderators would contribute to the development of a comprehensive model of the relationship between global diversification and firm performance.

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APPENDIX A. KIM'S (1989) ENTROPY MEASURE OF GLOBAL DIVERSIFICATION*

$$DT = UD + GMD + GRD \tag{A.1}$$

where DT = Total diversification
UD = Unrelated diversification
GMD = Global market diversification
GRD = Global related diversification

Mathematically,

$$DT = \sum_{a=1}^{A} \sum_{i \epsilon a} P_{ia} \ln(1/P_{ia}) \tag{A.2}$$

$$UD = \sum_{j=1}^{M} P_j \ln(1/P_j) \tag{A.3}$$

$$GMD = \sum_{j=1}^{M} P_j \sum_{a \epsilon j} P^j_{aj} \ln(1/P^j_{aj}) \tag{A.4}$$

$$GRD = \sum_{j=1}^{M} P_j \sum_{a \epsilon j} P^j_{aj} \sum_{i \epsilon a} P^{aj}_{iaj} \ln(1/P^{aj}_{iaj}) \tag{A.5}$$

* For details of the derivation of this measure, please refer to Kim (1989).

APPENDIX B. DEFICIENCIES IN GEOGRAPHIC-ORIENTED AND PRODUCT-ORIENTED MEASURES OF GLOBAL DIVERSIFICATION

Case 1: For global-oriented measure or GODI (see Appendix C for background), if a firm competes in multiple industries, that are each located in a different market region,

then $P^{a}_{aj} = P_{aj}/P_a = 1$ for $P_{aj} = P_a$

therefore, $\ln(1/P^{a}_{aj}) = \ln 1 = 0$

$$\Rightarrow \quad GUD = \sum_{a=1}^{N} P_a \sum_{j \epsilon a} P^{a}_{aj} \ln(1/P^{a}_{aj}) = 0$$

Case 2: For Kim's (1989) measure, if a firm competes in multiple industries, that are each located in a different market region,

then $P^{j}_{aj} = P_{aj}/P_j = 1$ for $P_{aj} = P_j$

therefore, $\ln(1/P^{j}_{aj}) = \ln 1 = 0$

$$\Rightarrow \quad GMD = \sum_{j=1}^{M} P_j \sum_{a \epsilon j} P^{j}_{aj} \ln(1/P^{j}_{aj}) = 0$$

Case 3: For Kim's (1989) measure, if a firm competes in multiple four-digit SIC industries, that are each located in a different market region,

then $P^{aj}_{iaj} = P_{iaj}/P_{aj} = 1$ for $P_{iaj} = P_{aj}$

therefore, $\ln(1/P^{aj}_{iaj}) = \ln 1 = 0$

$$\Rightarrow \quad GRD = \sum_{j=1}^{M} P_j \sum_{a \epsilon j} P^{j}_{aj} \sum_{i \epsilon a} P^{aj}_{iaj} \ln(1/P^{aj}_{iaj}) = 0$$

APPENDIX C. EQUIVALENCE IN THE EQUATION OF GODI

$$TGD = GLN + GUD + GRD \tag{C.1}$$

From Equations 4.1, 4.2, 4.3, and 4.5:

$$TGD = \sum_{a=1}^{N} P_a \ln(1/P_a) + \sum_{a=1}^{N} P_a \sum_{j \epsilon a} P_{aj}^{a} \ln(1/P_{aj}^{a})$$

$$+ \sum_{a=1}^{N} P_a \sum_{j \epsilon a} P_{aj}^{a} \sum_{i \epsilon j} P_{aji}^{aj} \ln(1/P_{aji}^{aj})$$

$$= \sum_{a=1}^{N} P_a \ln(1/P_a) + \sum_{a=1}^{N} P_a \sum_{j \epsilon a} P_{aj}^{a} [\ln(1/P_{aj}^{a}) + \sum_{i \epsilon j} P_{aji}^{aj} \ln(1/P_{aji}^{aj})]$$

$$= \sum_{a=1}^{N} P_a \ln(1/P_a) + \sum_{a=1}^{N} P_a \sum_{j \epsilon a} (P_{aj}/P_a) [\ln(P_a/P_{aj})$$

$$+ \sum_{i \epsilon j} (P_{aji}/P_{aj}) \ln(P_{aj}/P_{aji})]$$

$$= \sum_{a=1}^{N} P_a \ln(1/P_a) + \sum_{a=1}^{N} \sum_{j \epsilon a} [P_{aj} \ln(P_a/P_{aj})$$

$$+ \sum_{i \epsilon j} P_{aji} \ln(P_{aj}/P_{aji})] \qquad \text{(note 1)}$$

$$= \sum_{a=1}^{N} P_a \ln(1/P_a) + \sum_{a=1}^{N} \sum_{j\epsilon a} [P_{aj} \ln(P_a) + \sum_{i\epsilon j} P_{aji} \ln(1/P_{aji})]$$

$$= \sum_{a=1}^{N} [P_a \ln(1/P_a) + \sum_{j\epsilon a} P_{aj} \ln(P_a)$$

$$+ \sum_{j\epsilon a} \sum_{i\epsilon j} P_{aji} \ln(1/P_{aji})] \qquad \text{(note 2)}$$

$$= \sum_{a=1}^{N} \sum_{j\epsilon a} \sum_{i\epsilon j} P_{aji} \ln(1/P_{aji})$$

$$= \text{TGD}$$

Note 1 : $\ln(P_a/P_{aj}) = \ln(P_a) - \ln(P_{aj})$

and $\sum_{i\epsilon j} P_{aji} \ln(P_{aj}) = P_{aj} \ln(P_{aj})$

Note 2 : $\sum_{j\epsilon a} P_{aj} \ln(P_a) = P_a \ln(P_a)$

APPENDIX D. COMPARISON BETWEEN GODI AND PALEPU'S ENTROPY MEASURE OF DIVERSIFICATION

$$TGD = GLN + GUD + GRD$$

$$= \sum_{a=1}^{N} P_a \ln(1/P_a)$$

$$+ \sum_{a=1}^{N} P_a \sum_{j \epsilon a} P^a_{aj} \ln(1/P^a_{aj})$$

$$+ \sum_{a=1}^{N} P_a \sum_{j \epsilon a} P^a_{aj} \sum_{i \epsilon j} P^{aj}_{aji} \ln(1/P^{aj}_{aji}) \qquad (D.1)$$

If there is no global diversification, $N = 1$,

and $P_a = 1$, then $GLN = 0$.

Therefore,

$$TGD = 0 + \sum_{j} P_j \ln(1/P_j) + \sum_{j} P_j \sum_{i \epsilon j} P^j_{ji} \ln(1/P^j_{ji})$$

$$= UD + RD \qquad (D.2)$$

where UD and RD are components of Palepu's entropy measure.

APPENDIX E. EXPANSION OF GUD AND GRD COMPONENTS

The GUD and GRD components can be divided into multiple sub-components in terms of geographic regions. For example, if the study is focused on the difference between domestic and overseas diversification, the GUD component can be divided into domestic unrelated diversification (DUD) and overseas unrelated diversification (OUD) while the GRD can be divided into domestic related diversification (DRD) and overseas related diversification (ORD). The mathematical illustration is as follows:

Let a = 1 for domestic market region.

$$\mathrm{GUD} = \sum_{a=1}^{N} P_a \sum_{j \epsilon a} P_{aj}^{a} \ln(1/P_{aj}^{a})$$

$$= P_1 \sum_{j \epsilon (a=1)} P_{1j}^{1} \ln(1/P_{1j}^{1}) + \sum_{a=2}^{N} P_a \sum_{j \epsilon a} P_{aj}^{a} \ln(1/P_{aj}^{a})$$

$$= \mathrm{DUD} + \mathrm{OUD} \tag{E.1}$$

$$\mathrm{GRD} = \sum_{a=1}^{N} P_a \sum_{j \epsilon a} P_{aj}^{a} \sum_{i \epsilon j} P_{aji}^{aj} \ln(1/P_{aji}^{aj})$$

$$= P_1 \sum_{j \epsilon (a=1)} P_{1j}^{1} \sum_{i \epsilon j} P_{1ji}^{1j} \ln(1/P_{aji}^{aj})$$

$$+ \sum_{a=2}^{N} P_a \sum_{j \epsilon a} P_{aj}^{a} \sum_{i \epsilon j} P_{aji}^{aj} \ln(1/P_{aji}^{aj})$$

$$= \mathrm{DRD} + \mathrm{ORD} \tag{E.2}$$

APPENDIX F. MEASUREMENT OF GLOBAL DIVERSIFICATION

The data of the distribution of a firm's assets by both product and geographic area were required for the measurement of global diversification components in GODI. But such data were not publicly available in the form required for this study. Therefore, the required data were estimated by using the information obtained from company annual reports and Dun & Bradstreet's America's Corporate Families (for subsidiaries in the U.S.) and America's Corporate Families and International Affiliates (for subsidiaries in foreign countries). These sources provided information about a firm's product diversity and geographic distribution of assets.

Under the International Investment Survey Act of 1976, companies must report their overseas business transactions if their foreign revenues, assets or profits represent more than 10% of the corporate total. Therefore, company annual reports not only provide information about the business segments a firm is involved in, but also the distribution of its assets by business segment and by geographic area.

Another source of information, Dun & Bradstreet's publications, show the products, classified by four-digit SIC codes, and the location of the parent firm as well as each of its subsidiaries. The product SIC codes in which the corporation and each of its subsidiaries are involved in are arrayed in decreasing order of importance respectively. Dun & Bradstreet's publications have been used in previous research on diversification (Kim et al., 1989; Lemelin, 1982).

In general, these data sources provided the following information for the measurement of global diversification components in this study:

(1) Description of business segments.
(2) Assets by business segment.
(3) Assets by geographic area.
(4) Four-digit SIC codes of products of the corporate in decreasing order of importance.
(5) Four-digit SIC codes of products of each subsidiary in decreasing order of importance.
(6) Location of the parent firm and each of its subsidiaries.

Because the data sources did not record assets by SIC codes and subsidiary jointly, this study estimated the assets by SIC codes and geographic area jointly by the following procedures. Illustrations of the computation will follow.

(1) For firms without any foreign subsidiaries:

(i) Identify all business segments and their assets proportions.

(ii) Assign the identified SIC codes to respective business segments.

(iii) For each segment, keep the order of the SIC codes identified for the corporate (or major SIC codes) and put all other SIC codes identified for subsidiaries but not listed for the corporate (or minor SIC codes) at the end. Also, count the frequency of each minor SIC code.

(iv) Weight the SIC codes within the same business segment by a geometric series, i.e., consider each SIC code as only one half as important as the preceding one and determine the assets proportion of a SIC code by multiplying its weight by the assets proportion of the segment. For example, a business segment contains 2 major SIC codes and 3 minor SIC codes and each minor SIC code has shown up once only. There are 5 codes in total. All minor codes are placed at the back and not necessarily in order. The least 3 important codes (i.e., all minor codes) are assigned "1", "2" and "4" respectively. The second most important code (or the least important major code) is assigned "8" and the most important code is assigned "16". The sum of these number is 31. Then the weights of all minor codes are summed up and divided by their total frequency. In this case, the sum is 7 and the quotient is 7/3 (because there are 3 counts of minor codes). Therefore, 7/93 (i.e., 7/3 is further divided by 31) of the assets proportion of this segment is assigned to each minor code, 8/31 is assigned to the second most important code and 16/31 is assigned to the most important code. Estimation by geometric series has been used by Caves, Spence and Scott (1980) and Lemelin (1982) and assignment of equal weight to SIC codes has been used by Palepu (1985).

(2) For firms with foreign subsidiaries:
  (i) Do the first 3 steps in last procedure.
  (ii) Identify all geographic areas and their assets proportions.
  (iii) Assign all listed foreign subsidiaries to respective geographic areas.
  (iv) Divide the assets proportion of the geographic area evenly among all foreign subsidiaries listed under it. Assignment of equal weight among foreign subsidiaries has been used by Errunza and Senbet (1984) and Miller and Pras (1980).
  (v) Weight the SIC codes of the foreign subsidiary by the geometric series as before. Then assign the assets proportion of that subsidiary to each SIC code according to its weight.
  (vi) Sum up the assets proportion of the same SIC code across all foreign subsidiaries.
  (vii) Subtract the summed foreign assets proportion from the respective business segment .
  (viii) Do the step 1(iv) with the assets proportion of each business segment left after last step.

Values of global diversification components were computed according to Equations 4.2, 4.3, and 4.5. The distinction between related diversification and unrelated diversification was in terms of four-digit and two-digit SIC codes. Diversification across four-digit SIC industries within a broader defined two-digit SIC industry was referred to as related diversification while diversification across two-digit SIC industries was referred to as unrelated diversification (Jacquemin & Berry, 1979; Palepu, 1985). The composition of different geographic regions is shown in Table 5.3.

Illustration 1:

The information about product diversification and geographic dispersion of Chesapeake Corporation in 1988 is shown below. The values of the components of GODI (GLN, GUD, and GRD) are computed according to the Equations 4.2, 4.3, and 4.5 and the computation procedures for firms without any foreign subsidiaries as described above.

Company information:

Company :	Chesapeake Corporation
Year :	1988
Foreign subsidiary :	No

Business segments :	Paper	Packaging	Wood Products
Assets proportion :	.80504	.12521	.06975
Major SIC codes :	2621	2631	2421
(in order)	2611	2653	2426
Minor SIC codes :	2679(1)	5113(1)	2491(1)
(with frequency	5093(1)		
in parentheses)	5199(1)		

The assets proportion of each SIC code is evaluated according to step (iv) of the computation procedure as follows:

	Code	Assets Proportion
(1) Paper	2621	.41551
	2611	.20775
	2679	.06059
	5093	.06059
	5199	.06059
(2) Packaging	2631	.07155
	2653	.03577
	5113	.01789
(3) Wood Products	2421	.03986
	2426	.01993
	2491	.00996

Computation of the values of global diversification components[1]:

$$P_a = P_1 = 1$$
$$N = 1$$

a,j	$P^a_{aj} = P_{aj}$
1,24	.06975
1,26	.79117
1,50	.06059
1,51	.07848

a,j,i	P^{aj}_{aji}
1,24,2421	.03986/.06975 = .57147
1,24,2426	.01993/.06975 = .28574
1,24,2491	.00996/.06975 = .14280
1,26,2611	.20775/.79117 = .26259
1,26,2621	.41551/.79117 = .52518
1,26,2631	.07155/.79117 = .09044
1,26,2653	.03577/.79117 = .04521
1,26,2679	.06059/.79117 = .07658
1,50,5093	.06059/.06059 = 1
1,51,5113	.01789/.07848 = .22796
1,51,5199	.06059/.07848 = .77204

1: a = Code of a region
N = Total number of regions
j = Two-digit SIC code of an industry
i = Four-digit SIC code of an industry

Substituting all data into the equations:

$$GLN = \sum_{a=1}^{N} P_a \ln(1/P_a) = 0$$

$$GUD = \sum_{a=1}^{N} P_a \sum_{j \epsilon a} P^a_{aj} \ln(1/P^a_{aj}) = .74066$$

$$GRD = \sum_{a=1}^{N} P_a \sum_{j \epsilon a} P^a_{aj} \sum_{i \epsilon j} P^{aj}_{aji} \ln(1/P^{aj}_{aji}) = 1.09255$$

Illustration 2:

The information about product diversification and geographic dispersion of National Semiconductor Corp in 1984 is shown below. The values of the components of GODI (GLN, GUD, and GRD) are computed according to the Equations 4.2, 4.3, and 4.5 and the computation procedures for firms with foreign subsidiaries as described above.

Company information:

Company :	National Semiconductor Corp
Year :	1984
Foreign subsidiary :	Yes

Business segments :	Components	Digital Systems
Assets proportion :	.78159	.21841
Major SIC codes : (in order)	3674 3643 3471	3573 3574
Minor SIC codes : (with frequency in parentheses)		7392(1) 7379(1)

Geographic areas :	U.S.	Europe	Asia
Assets proportion :	.61358	.17422	.21220

There are 3 foreign subsidiaries identified, one in the U.K., one in Germany, and one in Hong Kong.

Number	Location	SIC code
1	U.K. (Europe)	7392 7379
2	Germany (Europe)	3674 3825 5063
3	Hong Kong (Asia)	3674 3679 5065

The assets proportion of each SIC code under each foreign subsidiary is evaluated according to steps (iii), (iv), and (v) of the computation procedure as follows:

Number	Location	Assets Proportion	SIC code (Assets Proportion)
1	U.K.	.08711	7392 (.05807)
	(Europe)		7379 (.02904)
2	Germany	.08711	3674 (.04978)
	(Europe)		3825 (.02489)
			5063 (.01244)
3	Hong Kong	.21220	3674 (.12126)
	(Asia)		3679 (.06063)
			5065 (.03031)

The assets proportion of each SIC code is evaluated according to step (vi), (vii), and (viii) of the computation procedure as follows:

(1) Components:

	Domestic	Foreign
Assets proportion:	.49472	.28687

SIC Code	Assets Proportion: Domestic (Foreign)
3674	.28270 (.17104)
3643	.14135
3471	.07067
3825	(.02489)
3679	(.06063)
5065	(.03031)

(2) Digital Systems:

	Domestic	Foreign
Assets proportion:	.11886	.09955

SIC Code	Assets Proportion: Domestic (Foreign)
3573	.06339
3574	.03170
7392	.01189 (.05807)
7379	.01189 (.02904)
5063	(.01244)

Values of global diversification components:
(the computation approach is as described in Illustration 1 above)

GLN = .93310

GUD = .85503

GRD = .51815

VITA

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DOCTORAL EXAMINATION AND DISSERTATION REPORT

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Approved:

Major Professor and Chairman

Dean of the Graduate School

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